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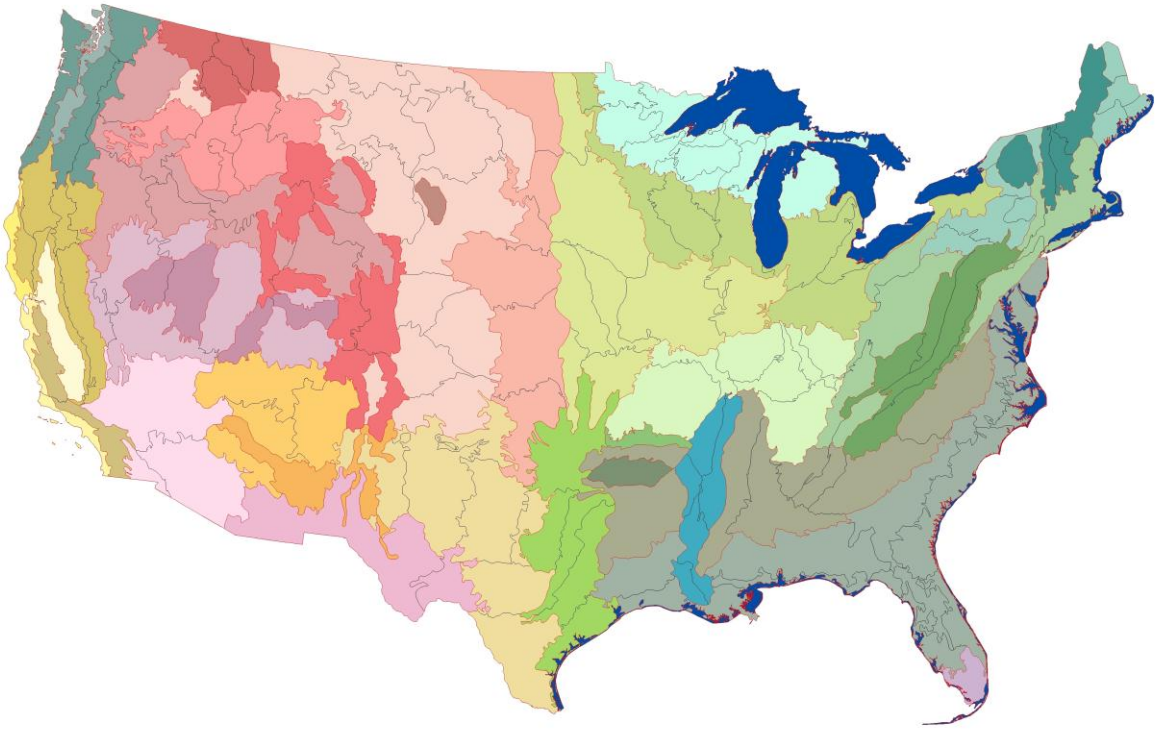
Description of "Ecological Subregions: Sections of the Conterminous United States"

First Approximation

Compiled by W. H. McNab, D. T. Cleland, J. A. Freeouf,
J. E. Keys, Jr., G. J. Nowacki, and C. A. Carpenter



Description of Ecological Subregions: Sections of the Conterminous United States

Front Cover

The U.S. Department of Agriculture Forest Service 2007 map "Ecological Subregions: Sections and Subsections of the Conterminous United States."

Sections, the largest ecological unit of the subregion planning scale of the U.S. Department of Agriculture (USDA) Forest Service National Hierarchical Framework of Ecological Units, are shown nested within provinces, the smallest unit of the ecoregion level. Sections are delineated primarily by evaluation and integration of physical and biological components including climate, physiography, lithology, soils, and potential natural communities. Not shown on the front cover map are subsection ecological units, which are subdivisions of sections. Together, sections and subsections form subregions that may be used for planning and assessments at regional scales. (Map electronic file provided by Alyssa M. Sloan, Michigan Technological University.)

Abstract

Preliminary descriptions are presented for the 190 section ecological units delineated on the U.S. Department of Agriculture Forest Service 2007 map "Ecological Subregions: Sections and Subsections of the Conterminous United States." Brief descriptions of the section map units provide an abstract primarily of the climate, physiography, and geologic substrate that combine to form ecosystems with distinctive vegetation and other unique ecological characteristics. Many descriptions are illustrated with a photograph of the landform and vegetation found in the section.

Compilers

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Back Cover

Selected mammals that inhabit one or more section map units and influence ecological processes therein. (Photos: National Park Service and USDA Forest Service.)

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U.S. Department of Agriculture, Forest Service
Ecosystem Management Coordination
Washington, DC 20250

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Preface

Acknowledgments

Photographs and descriptions presented in this document were obtained from several sources. Information for many descriptions and photographs were presented in a previous publication of the U.S. Department of Agriculture (USDA) Forest Service, “Ecological Subregions of the United States: Section Descriptions” (McNab and Avers 1995). The compilers of this document acknowledge the contributions made by authors and photographers listed in the 1995 publication.

A photograph supplements the description of about 80 percent of the sections. Many of the photographs in this document were used to illustrate another USDA Forest Service publication, General Technical Report (GTR) NE-321, “Experimental Forests and Ranges of the USDA Forest Service” (Adams et al. 2004). These photographs are identified as GTR NE-321, USDA Forest Service. We thank primary compiler M.B. Adams for providing those photographs, which she had obtained from other USDA Forest Service personnel. As a participant in the NE-321 publication, Andrew Youngblood of the Pacific Northwest Research Station provided additional photographs from his collection. Also, many photographs were obtained from Internet Web pages of agencies of the U.S. Government, including the Department of agriculture (Agricultural Research Service, Forest Service, Natural Resources Conservation Service, Soil and Water Conservation Districts); Department of Commerce (National Oceanic and Atmospheric Administration); and Department of Interior (National Park Service, Bureau of Land Management, Fish and Wildlife Service). Photographs from these agencies are in the public domain and the source of each was referenced.

Additional photographs were provided by resource managers and specialists associated with State conservation organizations, by compilers of this document, and by other individuals who provided written permission allowing their use.

Each photograph was the best available at the time this first approximation report was prepared, although the landscape depicted and quality, such as composition and resolution, of some was less than desired. Poor-quality and unrepresentative photographs will be replaced when better images become available.

Disclaimer

The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture or the Forest Service of any product or service to the exclusion of others that may be suitable. Considerable other descriptive information was available for these ecosystems, particularly for soil, natural disturbances, and vegetation; it could not be utilized, however, due to the limited time and resources available for preparation of this first approximation report.

Printing this electronic report

This report is available only in electronic form as one of several data, graphic, or text documents recorded on a CD-ROM that collectively comprise the 2007 USDA Forest Service publication General Technical Report WO-76: "Ecological Subregions: Sections and Subsections of the Conterminous United States." The report is formatted as a conventional USDA Forest Service printed publication, including the front and back cover. It is distributed as an electronic file in Adobe Portable Document Format (PDF). To view and print this publication, you will need Adobe Acrobat Reader, which is available at no cost via the Internet from Adobe Systems, Inc. A conventional paper copy of this electronic publication may be obtained by printing the PDF file on both sides of paper measuring 8.5 by 11 inches, and binding.

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Description of Ecological Subregions: Sections of the Conterminous United States

Overview

This document supplements the 2007 map "Ecological Subregions: Sections and Subsections of the Conterminous United States" (Cleland et al. 2007) by providing brief descriptions of units delineated at the section level. Sections are large land areas of relatively homogeneous physical and biological components that interact to form environments of similar productive capabilities, response to disturbances, and potentials for resource management. Logically, each map unit defines a region of unique ecological characteristics that differs from neighboring units.

The purpose of this report is to provide preliminary descriptions of the physical and vegetative features that were considered in the identification and delineation of section map units. Conventional physical data (e.g., elevation, temperature, lithologic and soil units, potential natural vegetation, etc.) for each ecological unit are provided in tabular electronic format on the CD-ROM that accompanies this report. Supplemental information on the process and methods used to delineate subregion map units is presented in an administrative paper (Keys et al. 2007). This first approximation report is a beginning of an ongoing process to develop, refine, and review descriptions of ecological units at the section tier of the national hierarchical framework (Cleland et al. 1997).

Organization and format

Information in this document is organized following the hierarchical structure of the national framework of ecological units developed by the Forest Service of the U.S. Department of Agriculture in 1993 (Cleland et al. 1997). The framework consists of four major levels or tiers, termed application scales, each of which nests within a higher tier. Three of the four application scales are subdivided into minor tiers of ecological units, each of which is more homogeneous than higher tiers. The structure of the framework is shown in the following tabulation:

Application scale	Ecological units	Principal map unit design criteria includes
National (ecoregions)		
	Domain	Broad climatic zones or groups
	Division	Regional climatic types, vegetational affinities
	Province	Dominant potential natural vegetation, mountains
Regional (subregions)		
	Section	Geologic stratigraphy and lithology, soils
	Subsection	Surficial geology, soils
National forest (landscapes)		
	Landtype association	Geologic formation, elevation, soils
Project (land units)		
	Landtype	Landform and topography, rock type, soils
	Landtype phase	Landform and slope position, soils

The appropriate tier to utilize for a task depends on the nature and scope of the issues under consideration, ranging from national to local in extent. The largest classified land units, ecoregions, are appropriate for national-scale applications and are subdivided into three successively smaller ecological units: domains, divisions, and provinces. Subregions, which are suitable for regional applications, are subdivided into two ecological units: sections and subsections. Snyder et al. (1999), for example, used smaller units of subregions (subsections) to propose a method for optimizing the selection of natural areas in the Superior National Forest. Additional information on the hierarchy is presented by Cleland et al. (1997).

Map unit description

This report presents information primarily for section ecological units, but also includes brief descriptions of provinces. Provinces (shown on the front cover map as large, uniformly colored units) were used to provide a general overview of climatic regimes and other common features, such as glaciation and vegetation physiognomic types, which tend to be similar for the underlying sections.

Information on provinces was summarized from Bailey (1995) who presents detailed descriptions that include land-surface form, vegetation, soils, and fauna in addition to climate. The geographical location of sections described within each province is shown as a solid color within a boxed area on a small outline map of the conterminous United States.

Descriptions are provided for sections, which are smaller and more homogeneous ecosystems that nest within provinces. Physical and biological features of section map units are presented as an abstract of lengthier, more detailed descriptions that were used previously (McNab and Avers 1995). The abstract format was utilized to facilitate the process of preparing this report in a timely manner. The text includes a succinct description of the prevailing physiography, broad geologic formations and one or more of the predominant, naturally occurring vegetative cover types. Cover types are listed in descending order of their extent in the section and are described in detail in appendix C. Information on vegetation was limited to its character and composition as an ecological component. Considerable other information was available for these ecosystems, such as soils, which was not feasible to include in this first approximation report. The description of fauna utilizing vegetation as habitat was beyond the scope of this draft report. Garrison et al. (1977), however, provides some information on this topic as part of their published descriptions of vegetation cover types. Most abstracts include a photograph that illustrates one view of the terrain and vegetation present in the section.

The ecological significance of units is indicated where it is apparent. Ecological significance, or importance, is one feature of a map unit that causes it to differ from its neighbors. For example, the subject section may be colder, wetter, or with rock formations or soils that vary from adjoining units, which causes the ecological relationships to differ. Because integration of several complex relationships may be required, the ecological significance of a unit is more difficult to assess and identify than are the individual physical properties.

Consider, for example, the ecological significance of Section 332B, Western Glaciated Plains Section, in eastern South Dakota. There, numerous shallow depressions in the glacial till fill with water and form semi-permanent and seasonal wetlands during spring snow melt, which serve as breeding areas for ducks and other birds. In contrast, other sections in the Great Plains have similar climate and vegetation, but lack the subsurface hydrological properties that allow retention of water. Water relationships are important environmental criteria that distinguish many subregion ecosystems.

Information in this document was obtained from various sources. Climatic information of provinces was extracted from information presented by Bailey (1995). Physical features and vegetation of many sections were abstracted from descriptions of map units of the earlier map (McNab and Avers 1995), published sources (such as Garrison et al. 1977, Albert 1995), and other sources (U.S. Department of Agriculture 2000), including personal knowledge.

Attribute data for subregion polygons are provided in digital spreadsheet format on the CD-ROM that accompanies this report. Attributes include variables associated with climate (temperature, precipitation, snowfall, relative humidity), geologic substrate, soil characteristics (depth, available moisture, bulk density), physiography, and potential natural vegetation. The attribute data may be used, for specialized analyses based on subregions or refinement of subregion boundaries as presently delineated on the map. For example, some ecological units delineated in the first approximation of subregions of the eastern United States (Keys et al. 1995) were refined and revised for the current national subregions map (Cleland et al. 2007) as a result of additional information becoming available.

Revision and Review

This first approximation of the section descriptions document has not been peer reviewed. Therefore, it should be regarded as a preliminary working draft that will be updated with additional information particularly for the geologic, soil, and disturbance environmental components. Also, a future revision will elaborate on what causes a section to differ ecologically from its neighbors. Province M221 and Section M221D, in this report, provide a tentative model of the planned expanded format. Peer review is planned for the revised descriptions.

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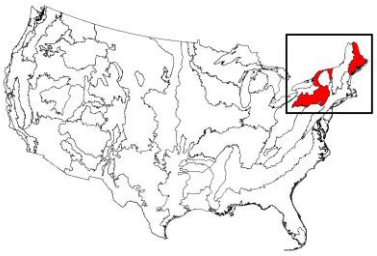
Map Unit Descriptions

211-Northeastern Mixed Forest Province



This province is characterized by a modified continental climatic regime with maritime influence along the Atlantic Ocean. Winters are moderately long with continual ground snow cover. Annual precipitation is generally equally distributed with a peak during summer. Vegetation of this area consists of forests that provide a transition between boreal conifers and broadleaf deciduous.

211A-Aroostook Hills and Lowlands Section

This section is a glacially scoured and dissected peneplain; terrain is gently rolling and pitted outwash plain with scattered low mountains. Bedrock consists of weakly metamorphosed sedimentary formations of shales, sandstones, and limestones. Vegetation is mainly forests of spruce-fir and maple-beech-birch cover types.

211B-Maine-New Brunswick Foothills and Lowlands Section

This section is a glacially scoured and dissected peneplain with gently rolling topography; dominated by a broad, central marine plain with other areas of gently sloping hills and low, rounded mountains. Formations are largely sedimentary rocks with areas of intruded igneous granites. Forest vegetation consists of spruce-fir and maple-beech-birch cover types.

211C-Fundy Coastal and Interior Section

This section is a glacially scoured and dissected peneplain with gently rolling topography characterized by low ridges surrounded by poorly drained and relatively flat terrain. Most bedrock is igneous. More precipitation occurs in winter than summer and days with fog are greater here than elsewhere in province. Natural vegetation is mostly forests of spruce-fir, maple-beech-birch, and aspen-birch cover types.

211D-Central Maine Coastal and Embayment Section

This section is a glacially scoured and dissected peneplain. Landscapes are generally flat to gently rolling with small area of knobby bedrock ridges and high hills. Bedrock geology is complex and consists of somewhat alternating bands of metasedimentary and metavolcanic formations, with scattered granitic plutons. Vegetation in this section is closed forest of spruce-fir, oak-hickory, and maple-beech-birch cover types. (Photo: Acadia National Park, National Park Service)

211E-St. Lawrence and Champlain Valley Section

This section is a glaciated landscape of wave-cut terraces and low hills; marine plains and rolling, low parallel ridges. Rocks are mostly carbonate and shales with some sandstones. Vegetation is mostly forests of maple-beech-birch, aspen-birch, and spruce-fir cover types. (Photo: USDA Natural Resources Conservation Service)

211F-Northern Glaciated Allegheny Plateau Section

This section is a maturely dissected glaciated plateau of rounded ridges and moderate relief with areas of irregular topography of high hills and steep valleys. Bedrock is sedimentary sandstones, siltstones, and shales. Forest vegetation consists of maple-beech-birch, oak-hickory, and aspen-birch cover types.

211G-Northern Unglaciated Allegheny Plateau Section

This section is an unglaciated, maturely dissected plateau with sharper ridge tops and narrower valleys compared to glaciated areas. Sedimentary bedrock formations include sandstones, siltstone, shales, and some limestones. Forest vegetation consists of maple-beech-birch and oak-hickory cover types. (Photo: Allegheny National Forest staff, USDA Forest Service)

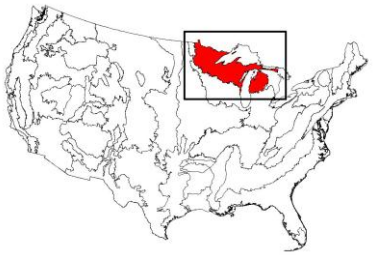
211I-Catskill Mountains Section

This section is a previously glaciated, deeply dissected plateau of mountainous terrain with many peaks more than 3,000 feet elevation and is characterized by rounded hilltops, cirques, steeply rolling uplands, ridges, and deep ravines. Soils have formed in geologic substrate of alluvial fine-textured sandstones, conglomerates, shales, and siltstones. Vegetation is mainly maple-beech-birch and oak-hickory cover types.

211J-Tug Hill Plateau-Mohawk Valley Section

This section is a glaciated plateau, which is similar in form to a tilted, flat-topped mesa. Erosion-resistant sandstone caps the plateau, which covers limestone and shale formations, some of which are exposed in a deeply incised river valley. Vegetation is forests of maple-beech-birch, oak-hickory, and aspen-birch cover types.

212-Laurentian Mixed Forest Province



The province is characterized by a continental climatic regime with maritime influence along the Great Lakes. Winters moderately long with continual ground snow cover; summers warm. Most precipitation occurs during summer. Low-relief, hilly landscapes are a product of past glaciation. Vegetation consists of forests that are a transition between boreal and broadleaf deciduous.

212H-Northern Lower Peninsula Section

This section has precipitation evenly distributed but with localized areas of high lake-effect snow. Area is glaciated, level to gently rolling lowlands and flat outwash areas, with dune fields near the Great Lakes. Sedimentary bedrock consists of limestones and dolomites. Forest vegetation consists of maple-beech-birch, aspen-birch, white-red-jack pine, and oak-hickory cover types. (Photo: USDA Natural Resources Conservation Service)

212J-Southern Superior Uplands Section

This section has glacial landscapes of level to gently rolling lowlands and flat lacustrine plains with equal areas of hillier uplands and escarpments. Bedrock, which is complex, includes felsic and mafic igneous formations; metamorphics of slate, schist, marble, and amphibolites; and some areas of sandstones. Rock outcrops are common in upland areas. Vegetation is forests of maple-beech-birch and aspen-birch cover types. (Photo: Ottawa National Forest, USDA Forest Service)

212K-Western Superior Uplands Section

This section has relatively uniform, undulating, poorly drained, level to rolling landscape of glacial drift plains consisting of ground and end moraines, and local drumlins; large areas of deep sands occur along eastern edge of the section. Loam soils formed in thick till covering most of bedrock, which consists of sandstones and shales. Forest vegetation consists of aspen-birch, maple-beech-birch, and spruce-fir cover types. (Photo: USDA Forest Service)

212L-Northern Superior Uplands Section

The physiography of this section consists of three types: a glacially scoured peneplain with lake-filled depressions in the north near Canada, highlands of drumlins on ground and end moraines, and uplands of low hills of the Mesabi Range with thin drift over iron-bearing rocks. Bedrock includes quartzite, iron oxides, granites, and mafic volcanics. Soils are variable, ranging from poorly to excessively drained sands and loamy sands. Dominant vegetation is mostly aspen-birch, spruce-fir, white-red-jack pine, and oak-hickory cover types. (Photo: National Park Service)

212M-Northern Minnesota and Ontario Section

The topography is flat glacial lake plain with low moraines and beach ridges. Bedrock is mostly granites, gabbro, quartzite, and iron oxides. Forest vegetation is aspen-birch and white-red-jack pine cover types. (Photo: GTR-NE-321, USDA Forest Service)

212N-Northern Minnesota Drift and Lake Plains Section

The precipitation is generally uniform in this section but is slightly greater during winter. Landscape is level to gently rolling lowland characterized by glacial features. Bedrock includes granites and isolated areas of shales and sandstones. Vegetation is a mixture of aspen-birch, white-red-jack pine, and spruce-fir cover types. (Photo: GTR-NE-321, USDA Forest Service)

212Q-North Central Wisconsin Uplands Section

The topography of this section is largely a glacial till plain with portions of moraines. Bedrock formations are sandstones with some gneiss. Soils are variable, ranging from sandy to silt loams that are poorly to well drained. Historic vegetation was forests consisting of maple-beech-birch, aspen-birch, and oak-hickory cover types.

212R-Eastern Upper Peninsula Section

The landscape is flat to gently rolling plains overlying sedimentary limestones, dolomite, and some shale; thick Cambrian sandstone is exposed along parts of the Lake Superior shoreline. Soils formed in thick glacial drifts and deposits of sand or clay. Vegetation is about equal proportions of aspen-birch, maple-beech-birch, white-red-jack pine, and spruce-fir cover types. (Photo: K. Hammond, USDA Forest Service)

212S-Northern Upper Peninsula Section

This section has landscape of flat plains with exposed bedrock knobs. Bedrock is basalts and granites. Soils formed in glacial outwash sands and are excessively drained. Vegetation is forests of maple-beech-birch and aspen-birch cover types.

212T-Northern Green Bay Lobe Section

The landscape is variable, consisting of mainly of ground moraines, with lesser areas of lacustrine plains, escarpment, sand dunes, and beach ridges; glacial outwash sand plains with rock outcrops are present along the western edge of this section. Rock formations of sandstones, limestones, and dolomite (bedrock outcrops of basalt or granites along western edge) are covered by diverse soils of lacustrine sands, loamy and poorly drained sands, with well-drained to excessively drained sands to the west. Historic vegetation was mostly forests of aspen-birch, maple-beech-birch, and spruce-fir cover types. (Photo: National Park Service)

212X-Northern Highlands Section

This section is a dissected glacial pitted outwash plain, end and ground moraines, and smaller areas of hilly terrain; kettle lakes and depressions are common in the northern part. Bedrock is mostly sandstones and shales with small areas of gneiss and metavolcanics. Soils formed in till deposits and range from sandy loam and silts to poorly or well-drained sands. Vegetation on much of the section was a combination of aspen-birch, maple-beech-birch, white-red-jack pine, and spruce-fir cover types. (Photo: GTR-NE-321, USDA Forest Service)

212Y-Southwest Lake Superior Clay Plain Section

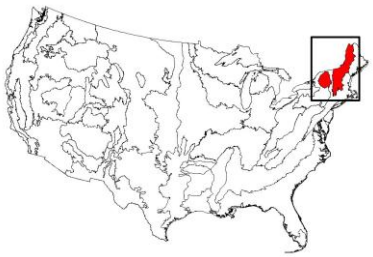
Lake Superior affects the climate of this section resulting in greater precipitation and milder temperature regimes compared to areas farther inland. Landscape is variously dissected, nearly level lake plain of lacustrine clays. Bedrock is mostly sandstones and shale that is covered by water-reworked moraine that formed mostly well-drained soils; some basalts occur in the north part of this unit. Historic vegetation was a forest dominated by conifers aspen-birch cover types. (Photo: National Park Service)

212Z-Green Bay-Manitowac Upland Section

The influence of Lake Michigan results in milder temperatures and more precipitation than sections farther inland. Terrain of this unit ranges from nearly level areas of lacustrine deposits to rolling hills of ground moraines. Bedrock is mostly shales and dolomites that has weathered to form a distinctive and extensive escarpment of cliffs. Soils include clays, loams, sands, and gravels, and many are calcareous in

mineral content. Forest vegetation was largely aspen-birch and white-red-jack pine cover types.

M211-Adirondack-New England Mixed Forest-Coniferous Forest-Alpine Meadow Province



This province has a modified continental climatic regime with long, cold winters and warm summers. Annual precipitation evenly distributed. Landscape is mountainous and was previously glaciated. Forest vegetation is a transition between boreal on the north and broadleaf deciduous to the south.

M211A-White Mountains Section

This section has a maturely dissected, irregular highland characterized by clusters of low, rounded mountains and scattered monadnocks with many glacial features. Rock formations include sedimentary quartzite, slate, and schist with extensive area of igneous rocks including granites, diorite, gabbro, and basalt. Forest vegetation consists of spruce-fir, maple-beech-birch, and aspen-birch cover types. (Photo: Staff, USDA Forest Service)

M211B-New England Piedmont Section

This section is a maturely dissected peneplain with open, low mountains and monadnocks. Rocks are mainly quartzite, slate, and schist with large areas of gneiss metamorphics and a belt of volcanics. Forest vegetation consists of maple-beech-birch and aspen-birch cover types.

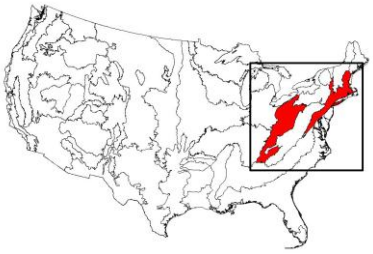
M211C-Green, Taconic, Berkshire Mountains Section

The landscape was previously glaciated mountain ranges that resulted in areas ranging from nearly flat-topped plateaus with scattered monadnocks to sharp ridges with deep valleys. Geologic formations include quartzite, schist, metavolcanics, gneiss, and amphibolite. Vegetation is forests of maple-beech-birch and aspen-birch cover types. (Photo: Staff, USDA Forest Service)

M211D-Adirondack Highlands Section

This subregion is a dissected, asymmetrical dome that has weathered to form mountainous terrain with rolling hills; relief is locally steep. Rocks under highest mountains consist of metanorthsite with mixed gneisses under the hills; sandstones are present in localized areas. Forest vegetation consists of maple-beech-birch, aspen-birch, and oak-hickory cover types. (Photo: USDA Natural Resources Conservation Service)

221-Eastern Broadleaf Forest Province



This province has a continental-type climate of cold winters and warm summers. Annual precipitation is greater during summer, water deficits infrequent. Topography is variable, ranging from plains to low hills of low relief along Atlantic coast. Interior areas are high hills to semi-mountainous, parts of which were glaciated. Vegetation is characterized by tall, cold-deciduous broadleaf forests that have a high proportion of mesophytic species.

221A-Lower New England Section

The landscape is a combination of broad, hilly plateaus with features including a basin, plain, and ridge. Bedrock geology is varied and complex, consisting of sedimentary, igneous, and metamorphic rocks. Forest vegetation includes oak-hickory, white-red-jack pine, maple-beech-birch, and aspen-birch cover types. (Photo: USDA Natural Resources Conservation Service)

221B-Hudson Valley Section

The physiography consists of linear lowlands of a glacial lake plain with high escarpments on both sides. Bedrock is a mixture of carbonates, shales, siltstones, and sandstones with areas of metasediments and metavolcanics. Vegetation consists of maple-beech-birch, oak-hickory, and aspen-birch cover types.

221D-Northern Appalachian Piedmont Section

This area is an unglaciated, maturely dissected peneplain sloping to the coast with hilly to rolling terrain with occasional high ridges. Bedrock is mostly a mixture of conglomerate-sandstones-shales with mixed metamorphics of marble, quartzite, slate, schist, and gneiss. Vegetation is a mixture mainly of oak-hickory and loblolly-shortleaf pine cover types. (Photo: U.S. Fish & Wildlife Service)

221E-Southern Unglaciated Allegheny Plateau Section

This section is a maturely dissected plateau of high hills, sharp ridges, and narrow valleys. Bedrock is mainly sandstone, siltstones, and shales with some limestones and coal. Forests are a mixture of oak-hickory and loblolly-shortleaf pine cover types. (Photo: H.McNab, USDA Forest Service)

221F-Western Glaciated Allegheny Plateau Section

This section has a maturely dissected upland modified by glaciation consisting of rounded hills, ridges and broad valleys. Bedrock composed of sedimentary formations of shales, sandstones, and coal. Vegetation is forests of maple-beech-birch, oak-hickory, and aspen-birch cover types. (Photo: H.McNab, USDA Forest Service)

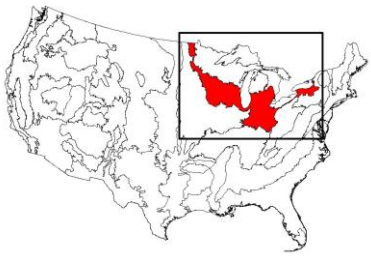
221H-Northern Cumberland Plateau Section

This area is moderately dissected level-bedded plateau of high hills with lesser areas of tablelands and low mountains. Rock formations are mainly sandstones and shales. Forests are mostly oak-hickory and oak-pine cover types. (Photo: R.Stephens, USDA Forest Service)

221J-Central Ridge and Valley Section

This section has a maturely dissected landscape of open hills with folded, faulted, and uplifted belt of parallel valleys and ridges. Carbonate rock formations dominate. Existing cover type is mainly agricultural and urban. Small areas of natural cover types remain consisting of forests of oak-hickory, oak-pine, and white-red-jack pine. (Photo H.McNab, USDA Forest Service)

222-Midwest Broadleaf Forest Province



The climate in this province is continental with warm to hot summers. Frequent growing season water deficits. Flat to hilly terrain with features associated with former glaciation. Vegetation consists of cold-deciduous, hardwood-dominated forests with a high proportion of species able to tolerate mild, brief, periodic drought during the late summer.

222H-Central Till Plains-Beech-Maple Section

The landscape is level to gently rolling till plains with broad bottom lands. Soils derived from thick ground and end moraines. Sedimentary rocks are under the till. Existing cover type is mainly agricultural and urban. Small areas of natural cover types consist of forests of maple-beech-birch, oak-hickory, and aspen-birch.

222I-Erie and Ontario Lake Plain Section

The landscape is level to gently rolling till and lake plains. Soils developed in thick tills and lacustrine deposits. Forests are maple-beech-birch, aspen-birch, and white-red-jack pine cover types. (Photo: A. Baglin, USDA Agricultural Research Service)

222J-South Central Great Lakes Section

This section has level to gently rolling lowlands formed from glacial ground moraine and flat outwash plains. Soils formed in thick glacial drift, till, lake sediments and outwash. Sedimentary rocks lie beneath the drift. Existing cover type is mainly agricultural and urban. Natural cover types are forests of oak-hickory, maple-beech-birch, and elm-ash-cottonwood. (Photo: U.S. Fish & Wildlife Service)

222K-Southwestern Great Lakes Morainal Section

This section has relatively uniform, undulating landscape of glacial drift plains consisting of ground and end moraines, and local drumlins; large areas of deep sands occur along eastern edge of the section. Loam soils formed in thick till covering most of bedrock, which consists of sandstones and shales. Current vegetation is agricultural and urban cover types; historic vegetation was oak-hickory, maple-beech-birch, and prairie cover types. (Photo: B. Nichols, USDA Natural Resources Conservation Service)

222L-North Central U.S. Driftless and Escarpment Section

Parts of this section receive above average snowfall resulting from its location bordering two Great Lakes. Section is a maturely dissected unglaciated upland plateau with steep-sided bedrock ridges and mounds. Loess covers much of bedrock, which consists of sandstones, dolomite, and shales; soils are silt loams and sandy loams. Mounds and ridges are capped by resistant dolomite. Current cover types are mostly urban and agricultural; historical vegetation consisted of oak-hickory and prairie cover types; the elm-ash-cottonwood cover type was along rivers. (Photo: National Park Service)

222M-Minnesota and Northeast Iowa Morainal-Oak Savanna Section

The landscape is level plains and low, rolling hills resulting from glaciation. Soils formed in glacial drift and thin, discontinuous layer of loess. Bedrock is mixture of granites, greenstones, and metasediments with equal area dolomite and sandstone. Existing cover type is primarily agricultural; historic vegetation was a mosaic of oak-hickory, prairie, maple-beech-birch, and elm-ash-cottonwood cover types. (Photo: USDA Forest Service)

222N-Lake Agassiz-Aspen Parklands Section

The landscape in this section is formed from large, level lake (Glacial Lake Agassiz). Thick glacial drift covers bedrock of granites and greenstones. Pre-European settlement vegetation was aspen-birch and prairie cover types, which have mostly been replaced with agricultural crops.

222R-Wisconsin Central Sands Section

This section is a flat to slightly rolling lake (Glacial Lake Wisconsin) plain with scattered, exposed sandstone buttes. Underlying geology is mostly erosion-resistant sandstone with localized areas of gneiss and granitic rocks. Soils formed in glacial outwash sands and are mostly excessively drained, but small

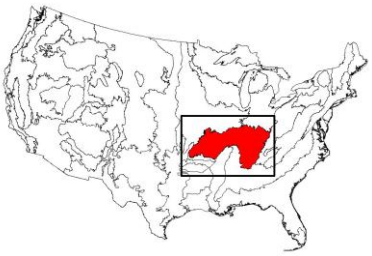
areas of poorly drained swamps also occur. Historic vegetation was a mixture of aspen-birch, oak-hickory, and white-red-jack pine cover types.

222U-Lake Whittlesey Glaciolacustrine Plain Section

The terrain is dissected flat plain with underlying bedrock of sedimentary formations, including sandstones, shales, limestone, and gypsum. Soils are derived from thick lake deposits and most are loamy or clayey in texture; some are poorly drained. Existing cover type is mainly agricultural and urban. Small areas of natural cover types consist of forests of elm-ash-cottonwood and oak-hickory.

223-Central Interior Broadleaf Forest Province

This ecoregion has continental climate with hot summers. Summer soil moisture deficits are common. Vegetation is broadleaf deciduous forests with somewhat open canopy and greater density of species tolerance of drought.



223A-Ozark Highlands Section

This section has a high plateau of steep hills and low rolling hills, with widespread areas of loess deposits; maturely dissected. Bedrock consists of dolomite and sandstone; the highest hills are igneous volcanics, including rhyolite and andesite. Vegetation is largely forests of oak-hickory and oak-pine cover types. (Photo: T. McCabe, USDA Agricultural Research Service)

223B-Interior Low Plateau-Transition Hills Section

The landscape is highly dissected and hilly with high relief, which forms a transition between subregions to the east and west. Soils developed in geologic formations consisting of sandstones and limestones. Vegetation is mainly the oak-hickory cover type.

223D-Interior Low Plateau-Shawnee Hills Section

This section has a varied landscape of mostly of sandstone bluffs, steep-sided ridges and hills with broad valleys. Much of the section is underlain by level-bedded sandstones with areas of thick limestones and regions of limestone-karst terrain. Vegetation consists mostly of oak-hickory and oak-gum-cypress cover types.

223E-Interior Low Plateau-Highland Rim Section

This section has a level-bedded, uplifted plateau; surface is moderately to deeply dissected surface. Landforms are mostly open hills and irregular plains composed mainly of sandstones that weather to deep soils with subsoil high in clay content. The Nashville Basin forms a large inclusion with deeply dissected and undulating terrain. The oak-hickory cover type predominates. (Photo: National Park Service)

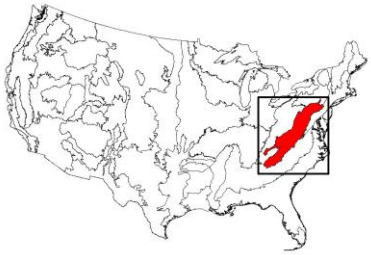
223F-Interior Low Plateau-Bluegrass Section

This subregion is a moderately dissected plateau of irregular plains and open hills. Geologic formations are mostly marine deposits of limestones, shales, and sandstone. Existing cover type is mainly agricultural and urban. Small areas of natural cover types remain consisting of forests of oak-hickory, maple-beech-birch, and oak-gum-cypress cover types.

223G-Central Till Plains-Oak Hickory Section

In this section, landforms are of two types: flat plains with shallow drainage entrenchment in areas of deep till and undulating on shallow till. Formations are sandstones in local areas of exposed rocks. Forests consist of oak-hickory cover type.

M221-Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow Province



This province has a temperate climate with cool summers and short, mild winters. Annual precipitation is plentiful and evenly distributed with short, infrequent periods of water deficit. Landscapes of the province are predominantly mountainous but sections vary in predominant elevation, geologic substrate, and physiography. Forest vegetation is characterized by a closed canopy of deciduous, xerophytic tree species, mainly oaks, although many mesophytic species occur on lower slopes and in mountain valleys; broadleaf forests change to coniferous or shrub lands at higher elevations. Ice storms are an important broad scale disturbance. High-intensity rain storms are associated with remnants of occasional hurricanes; lightning-caused fires are uncommon in the humid environment of this province. Loss of American chestnut resulting from an introduced pathogen was a major disturbance to the canopy of most forests during the 1920s.

M221A-Northern Ridge and Valley Section

This section has broad, shallow, northeast-southwest parallel valleys underlain primarily by carbonate formations separated by low ridges having sandstone cap rocks. The oak-hickory cover type makes up most of the forests. (Photo: USDA Agricultural Research Service)

M221B-Allegheny Mountains Section

This section has a maturely dissected plateau characterized by high, sharp ridges, low mountains, and narrow valleys. Bedrock consists of shales, siltstones, carbonates, and sandstones. Forest vegetation consists of oak-hickory and maple-beech-birch cover types. (Photo: Monongahela National Forest, USDA Forest Service)

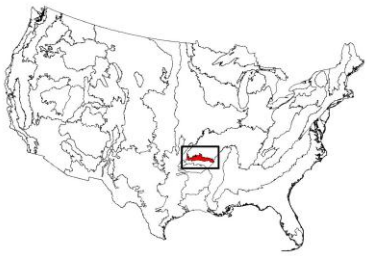
M221C-Northern Cumberland Mountains Section

The terrain consists of long monoclinal mountains and dissected uplands. Rock formations are level-bedded sandstones that have been eroded to form mountainous terrain. Forests are the oak-hickory cover type. This section is higher elevation than adjacent map units, which contributes to its ecological significance. (Photo: National Park Service)

M221D-Blue Ridge Mountains Section

The surface of this section is a gently west-sloping plateau defined on the east by a steep escarpment rising 300 m above section 231I. Topography consists of moderately high (1,000 - 1,500 m), highly weathered mountain ranges, with scattered high-elevation (2,000 m) peaks. The Precambrian-Cambrian bedrock geology is mostly metamorphosed gneisses and schists formed from recrystallization of non-carbonate sedimentary, volcanic, or igneous parent rock material. Soils are deep, well-drained, acidic (pH<5.5), infertile sandy and gravelly loams; surface horizons of high-elevation frigid soils have a high organic content. Vegetation is forests consisting of oak-hickory, white-red-jack pine, and oak-pine cover types; above 1,500 m elevation forests become dominated by coniferous spruce-fir. Evergreen ericaceous shrubs occupy the understory of many dry ridges. Most gentle lower slopes were cleared for subsistence agriculture during the 1800s and most forests had been selectively logged by the early 1900s. Rainfall is highly variable, ranging from >2,000 mm in areas along the escarpment that are influenced by orographic uplift, particularly near section 231I in South Carolina, to <1,250 mm in the nearby Asheville basin, which is situated in a rainshadow. The climate of section M221D is cooler and wetter than that of adjoining sections. Characteristic fauna includes northern flying squirrel and Canada warbler of high-elevation forests, Southern Appalachian brook trout associated with cold water of high-energy streams, and a high diversity of salamanders. (Photo: H.McNab, USDA Forest Service)

M223-Ozark Broadleaf Forest-Meadow Province

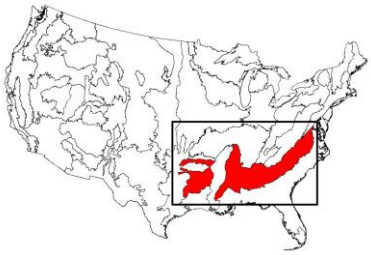


The climate regime of this province is of a continental type with cold winters and hot summers. Landscape is low mountains formed by dissection of sedimentary formations. Forest vegetation is predominately broadleaf deciduous species that can tolerate brief periods of drought.

M223A-Boston Mountains Section

This section has a level-bedded plateau mainly of sandstones with some limestones that is strongly dissected to form terrain of low mountains. Forest vegetation consists of oak-hickory and oak-pine cover types. (Photo: C. Tracey, Arkansas Natural Heritage Commission)

231-Southeastern Mixed Forest Province



This ecoregion has generally uniform maritime climate with mild winters and hot, humid summers. Annual precipitation is evenly distributed, but a brief period of mid to late summer drought occurs in most years. Landscape is hilly with increasing relief farther inland. Forest vegetation is a mixture of deciduous hardwoods and conifers.

231A-Southern Appalachian Piedmont Section

The terrain is moderately dissected, irregular plains with occasional isolated high hills or low mountains on more resistant formations. Underlain by highly metamorphosed crystalline rocks that have weathered to form deep, infertile clayey soils now highly eroded from long, intensive cultivation. Forest cover is a mixture of loblolly-shortleaf pine and oak-pine cover types. (Photo: U.S. Fish & Wildlife Service)

231B-Coastal Plains-Middle Section

The topography varies from strongly rolling to hilly or nearly mountainous landscape of marine-deposited sediments ranging from sands and silt to chalk and clays, which vary in reaction from acid to alkaline. Vegetation is variable and includes oak-pine, loblolly-shortleaf pine, or oak-hickory cover types. (Photo: National Park Service)

231C-Southern Cumberland Plateau Section

The terrain is gently sloping tablelands of level-bedded sandstone formations and hilly to mountainous terrain consisting of shale and sandstone slopes forming deep canyons with steep connecting escarpments. Forests are largely oak-pine, loblolly-shortleaf pine, or oak-hickory cover types. (Photo: Bankhead National Forest, USDA Forest Service)

231D-Southern Ridge and Valley Section

This subregion has highly folded, linear sandstone and limestone formations resulting in topography of parallel, northeast-southwest trending, elongated synclinal valleys and rounded ridges with gentle to moderate slopes. Forests are oak-pine, loblolly-shortleaf pine, or oak-hickory cover types. (Photo: Chattahoochee-Oconee National Forest staff, USDA Forest Service)

231E-Mid Coastal Plains-Western Section

This section has moderately dissected irregular plains of marine sands and clays with isolated influence of limestones. Vegetation is mixture of forests of loblolly-shortleaf pine, oak-pine, oak-hickory, or oak-gum-cypress cover types.

231G-Arkansas Valley Section

This section has folded, faulted, and uplifted belt of moderately dissected parallel valleys and ridges that form a landscape of plains with hills. Rock formations are sedimentary deposits of sandstones, shales, limestones, and coals. Vegetation is forests of oak-hickory, oak-pine, and loblolly-shortleaf pine cover types.

231H-Coastal Plains-Loess Section

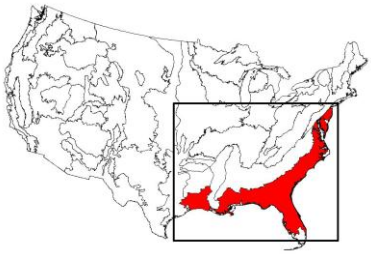
This section consists of irregular plains and gently rolling hills, with steep bluffs near the Mississippi River. Wind-deposited, deep, fine-texture loess soils of varying thickness are distinctive for this subregion. Forest vegetation is oak-pine, loblolly-shortleaf pine, oak-hickory, and oak-gum-cypress cover types. (Photo: L.Betts, USDA Natural Resources Conservation Service)

231I-Central Appalachian Piedmont Section

This section has a moderately dissected plain of irregular plains with high and low hills underlain by metamorphic formations of schists and phylites that have weathered to form thick saprolite and deep soils with heavy clay subhorizons. Vegetation is forests of loblolly-shortleaf pine and oak-hickory cover types. (Photo: USDA Natural Resources Conservation Service)

232-Outer Coastal Plain Mixed Forest Province

This province is an ecoregion of humid, maritime climate; winters are mild and summers are warm. Precipitation is abundant with rare periods of summer drought. Upland forest vegetation is dominated by conifers, with deciduous hardwoods along major floodplains.



232A-Northern Atlantic Coastal Plain Section

The terrain is flat, weakly dissected alluvial plain. Soils formed in a thick layer of recent marine deposits (shales and sands). Vegetation is forests of oak-hickory, oak-pine, and loblolly-shortleaf pine cover types. (Photo: GTR-NE-321, USDA Forest Service)

232B-Gulf Coastal Plains and Flatwoods Section

This section has a flat, weakly dissected landscape of irregular or smooth plains formed on marine deposits of sands and clays. Natural vegetation consists of longleaf-slash pine, loblolly-shortleaf pine, and oak-hickory cover types, with oak-gum-cypress along rivers. (Photo: Apalachicola National Forest, USDA Forest Service)

232C-Atlantic Coastal Flatwoods Section

This section is weakly dissected, flat alluvial plain of well drained deep sands with local areas of highly organic soils. The main forest vegetation is forests of longleaf-slash pine and loblolly-shortleaf pine cover types, with oak-gum-cypress along rivers. (Photo: National Oceanic and Atmospheric Administration)

232D-Florida Coastal Lowlands-Gulf Section

This area is generally flat, mostly sandy poorly drained soils with shallow water table. Widely scattered, shallow inundated depressions, often with hydrophilic species such as cypress. Vegetation is mostly longleaf-slash pine and oak-gum-cypress cover types. (Photo: USDA Forest Service)

232E-Louisiana Coastal Prairies and Marshes Section

This area is flat, weakly dissected, alluvial plain with marine-deposited continental sediments ranging from sands to clays, with some organics. Large proportion of area consists of poorly drained soils. Hurricanes are a frequent disturbance of forests. Vegetation consists of longleaf-slash pine and oak-gum-cypress cover types. (Photo: B. Tarpenning, USDA Agricultural Research Service)

232F-Coastal Plains and Flatwoods-Western Gulf Section

This section has level, undissected plains of alluvial sands recently deposited on unconsolidated limestone formations. Soils poorly drained; large, shallow depressions common that are continually saturated. Forest vegetation consists of loblolly-shortleaf pine and longleaf-slash pine cover types. (Photo: National Park Service)

232G-Florida Coastal Lowlands-Atlantic Section

This section has level, undissected plains of alluvial sands recently deposited on unconsolidated limestone formations. Soils poorly drained; large, shallow depressions common that are continually saturated. Small, elevated areas of deeper, excessively drained sands occur along some coastal areas. Vegetation is longleaf-slash pine and oak-gum-cypress cover types. (Photo: H. McNab, USDA Forest Service)

232H-Middle Atlantic Coastal Plains and Flatwoods Section

This section has weakly to moderately dissected irregular plains with localized area of highly organic soils. Forest cover is primarily loblolly-shortleaf pine and oak-gum-cypress cover types. (Photo: U.S. Fish and Wildlife Service)

232I-Northern Atlantic Coastal Flatwoods Section

This ecoregion consists of sea-level to slightly higher level plains, with swamps, estuaries, and barrier islands. Soils are largely coarse textured and poorly drained that have formed in recently deposited marine sands; localized areas of organic, peat soils occur. Vegetation consists of loblolly-shortleaf pine and oak-gum-cypress cover types. (Photo: Croatan National Forest, USDA Forest Service)

232J-Southern Atlantic Coastal Plains and Flatwoods Section

The terrain is weakly dissected irregular or smooth plains underlain about equally by sands and clays of marine and continental origin. Vegetation is mainly a mixture of loblolly-shortleaf pine, longleaf-slash pine, oak-pine, and oak-gum-cypress cover types. (Photo: H. McNab, USDA Forest Service)

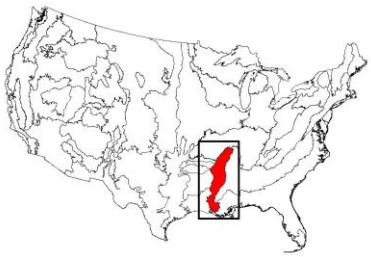
232K-Florida Coastal Plains Central Highlands Section

The terrain is hilly with excessively drained, coarse deep sands, and loamy sands. Sinkholes present in areas of recently deposited calcareous geologic formations. Forests consist of longleaf-slash pine and oak-hickory cover types. Much of the original forest vegetation has been removed and replaced by highly cultivated citrus groves. Section is ecologically significant because environments are drier than adjacent units. (Photo: H. McNab, USDA Forest Service)

232L-Gulf Coastal Lowlands Section

The landscape is flat, weakly dissected alluvial plain of marine (limestones) and terrestrial (sands) deposits. Vegetation is mostly longleaf-slash pine and oak-gum-cypress cover types. (Photo: National Oceanic and Atmospheric Administration)

234-Lower Mississippi Riverine Forest Province



The climate of this province is characterized by warm winters and hot summers. Precipitation occurs throughout the year with minimum in fall. Much of this subregion is influenced by periodic flooding of the Mississippi River. Vegetation was initially forests of cold-deciduous, mesophytic hardwoods, which have now largely been cleared and cultivated.

234A-Southern Mississippi Alluvial Plain Section

This section has low, flat, weakly to moderately dissected alluvial plains formed by deposition of continental sediments. Climatic regime is mainly maritime that is more mesic than 234E, but more xeric than 234C. Agricultural crops are the cover type where soils are adequately drained. Oak-gum-cypress cover type dominates areas dry enough to cultivate with other areas of loblolly-shortleaf pine. (Photo: Staff, U.S. Fish & Wildlife Service)

234C-Atchafalaya and Red River Alluvial Plains Section

This section has flat, weakly to moderately dissected alluvial plains formed by deposition of continental sediments. Well-drained to poorly drained soils; many are fine textured. Vegetation consists of prairie, oak-gum-cypress, and longleaf-slash pine cover types. (Photo: USDA Natural Resources Conservation Service)

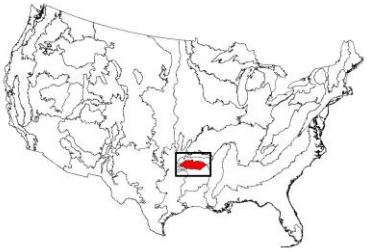
234D-White and Black River Alluvial Plains Section

This section is a flat, weakly to moderately dissected alluvial plain formed by deposition of continental sediments. Much of the natural vegetation has been cleared for cultivation; small areas remain of oak-gum-cypress and oak-hickory cover types. (Photo: Wapanocca National Wildlife Refuge, U.S. Fish & Wildlife Service)

234E-Arkansas Alluvial Plains Section

This section has flat, weakly to moderately dissected alluvial plains formed by deposition of continental sediments. Climatic regime is modified continental. Current cover type is largely agricultural; fragmented natural vegetation is forests of oak-gum-cypress, oak-hickory, and oak-pine cover types. (Photo: National Park Service)

M231-Ouachita Mixed Forest-Meadow Province

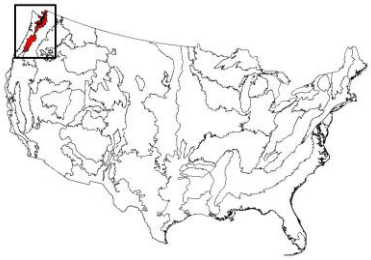


This province has continental climate, with short, cool winters and long, hot summers. Precipitation occurs throughout year, but summers are dry. Vegetation consists of mixed needle leaf and cold-deciduous broadleaf forests.

M231A-Ouachita Mountains Section

The landscape is low mountains to open, high hills with mostly dry to subxeric soils formed by differential erosion of bedrock ranging in composition from carbonates, shales, limestones, and sandstones. Vegetation is forests of loblolly-shortleaf pine, oak-pine, and oak-hickory cover types. Elevations here are higher than surrounding sections. (Photo: Ouachita National Forest, USDA Forest Service)

242-Pacific Lowland Mixed Forest Province



This province has a mild, modified marine climate with moderate precipitation occurring more heavily during winter. Topography ranges from level plains to isolated hills and low mountains. Natural vegetation was dominated by forests of needleleaf species, but now has been replaced by agriculture.

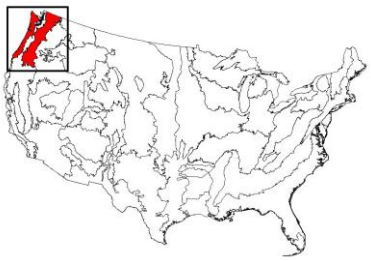
242A-Puget Trough Section

The landscape is glaciated, lowland plain of ground moraines, outwash plains, floodplains over volcanic basalts. Vegetation originally consisted largely of Douglas-fir cover type. This section is in the rain shadow of high mountains to the west and has a somewhat drier climate. (Photo: Nisqually National Wildlife Refuge, U.S. Fish & Wildlife Service)

242B-Willamette Valley Section

This section is a broad, level to hilly, valley of continental alluvial sediments over basalt volcanic rocks. Natural vegetation was primarily forests of Douglas-fir cover type with smaller areas of prairie grasslands; now mostly agricultural. (Photo: Staff, U.S. Fish & Wildlife Service)

M242-Cascade Mixed Forest-Coniferous Forest-Alpine Meadow Province



This ecoregion has some areas of mild maritime-influenced climate and other areas of cold-dry continental influence. Annual precipitation is variable and occurs mostly in winter as snow. Landscape is variable, mostly of volcanic origin, ranging from high mountains with strong relief to foothills and plateaus. Vegetation is primarily forests of evergreen needleleaf trees.

M242A-Oregon and Washington Coast Ranges Section

This section has a landscape of high mountains with deeply incised, fault-controlled drainages and coastal lowlands formed from active mountain erosion. Formations are sandstones, siltstones, and shales with interspersed marine basalts. Glacial till is present in some areas. Forests are a mixture of Douglas-fir and hemlock-Sitka spruce cover types. (Photo: GTR-NE-321, USDA Forest Service)

M242B-Western Cascades Section

This area is mountainous with moderate to high elevations; some glaciation. Precipitation is greater than ecoregion to east. Rock formations are a complex mostly of basalts, but with some granites, and diorites. Forests consist of Douglas-fir and fir-spruce cover types with areas of alpine tundra. (Photo: GTR-NE-321, USDA Forest Service)

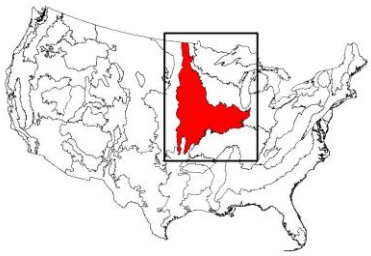
M242C-Eastern Cascades Section

This section is mountainous of moderate to high elevations; glaciation in some areas. Precipitation less than occurs in ecoregion to west. Rocks are mostly volcanic andesite and basalts. Many soils formed in thick layers of ash, pumice, and cinders. Forests are ponderosa pine and Douglas-fir cover types. (Photo: A. Youngblood, USDA Forest Service)

M242D-Northern Cascades Section

This subregion consists of high, rugged mountains with areas of glaciers at highest elevations. Soils have formed in sedimentary and metamorphic rock formations. Climatic regimes are modified marine in west and continental in east. Vegetation at mid to high elevations is a mixture of fir-spruce, ponderosa pine, Douglas-fir, hemlock-Sitka spruce, or lodgepole pine cover types; alpine is at the highest elevations. (Photo: National Park Service)

251-Prairie Parkland (Temperate) Province



This ecoregion has a continental climate with cold winters and hot summers. Moderate amounts of precipitation that occurs mainly during growing season. Landform is mainly plains with areas of low hills. Vegetation was once herbaceous with woodland of scattered deciduous broadleaf trees along floodplains of major rivers; almost all has now been cleared for agriculture.

251A-Red River Valley Section

This section is primarily a large, level plain partly formed by former glacial lake (Lake Agassiz). Soils formed in thick till over granites, metasediments, and greenstones. Natural vegetation was mostly prairie and elm-ash-cottonwood cover types; now mostly agriculture. (Photo: USDA Agricultural Research Service)

251B-North Central Glaciated Plains Section

This landscape is mostly level to rolling till plain with glacial features of morainal ridges. Bedrock is mixed metaigneous and sedimentary formations, which is covered by a thick layer of till, drift, and sands. Current cover type is mostly agricultural; historic vegetation consisted of prairie, elm-ash-cottonwood, and oak-hickory cover types. (Photo: J. Freeouf, USDA Forest Service)

251C-Central Dissected Till Plains Section

This section has flat to level, moderately dissected rolling plains; some parts were formerly glaciated. Moderately thick to thin layer of loess and till cover bedrock of shales, sandstone, and carbonate formations. Current vegetation is largely agricultural cover types; natural vegetation was a combination of oak-hickory, and prairie, with elm-ash-cottonwood cover types along rivers. (Photo: D. Kurz, Missouri Department of Conservation)

251D-Central Till Plains and Grand Prairies Section

This section has a level to gently rolling till-plain with broad bottomlands with associated terraces and meander scars along major river valleys. Bedrock of limestones, shales, and sandstones is covered with a thick layer of till and loess on bluffs along the Mississippi flood plain. Current vegetative cover is mainly agricultural; natural vegetation was forests of oak-hickory and elm-ash-cottonwood cover types. (Photo: USDA National Agroforestry Center)

251E-Osage Plains Section

This subregion is characterized by low, parallel, maturely dissected escarpments that separate level plains from gently rolling plains. This unit is underlain by shales, limestones, and sandstones that form shallow and fertile, but somewhat dry, soils. Agricultural production is the predominant cover type; natural vegetation was predominately oak-hickory forest and prairie. (Photo: D. Kurz, Missouri Department of Conservation)

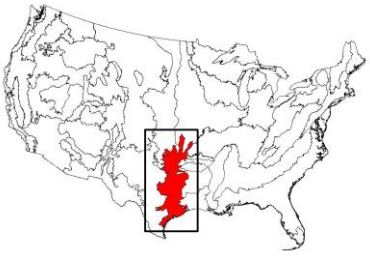
251F-Flint Hills Section

This section consists of low, gently sloping hills over carbonate and shale rocks that form shallow, stony soils; smaller areas of glacial tills are in the northeast. Natural vegetation was prairie cover type, which has been retained more so here than in adjacent sections because soil is somewhat shallow and unsuitable for cultivation. (Photo: National Park Service)

251H-Nebraska Rolling Hills Section

This section is level to gently rolling and hilly plains. Soils formed in glacial till on uplands or in wind-deposited loess or alluvium in floodplains along major rivers. Original vegetation was prairie cover type, most of which has been cleared for agriculture; elm-ash-cottonwood forests remain along rivers. (Photo: J. Freeouf, USDA Forest Service)

255-Prairie Parkland (Subtropical) Province



This province has a modified maritime subtropical, humid climate of relatively warm winters and hot summers. Moderate amounts of precipitation occurring during summer. Landforms are plains with low hills. Vegetation is mainly herbaceous with areas of deciduous broadleaf woodland, particularly along floodplains.

255A-Cross Timbers and Prairies Section

The terrain is mostly irregular plains with smaller areas of plains with hills and open high hills underlain by semixeric soils derived from marine deposits of sandstones, shales, and limestones. Moisture is limited for use by vegetation during part of the growing season. Vegetation includes oak-hickory and Great Plains grasslands cover types. (Photo: H. McNab, USDA Forest Service)

255B-Blackland Prairies Section

This section has rolling to highly dissected terrain characterized by dark, alkaline clays interspersed with smaller areas of acid sandy loams. Surface drainage is rapid mainly due to relief. Natural vegetation was mainly prairie and small areas of oak-hickory cover types

255C-Oak Woods and Prairies Section

The landscape is variable, ranging from low hills in west to gently rolling plains in east, geology sandstones in west, and calcareous in east. Soil ranges from sandy loam to clays. Vegetation consists of oak-hickory and oak-pine cover types.

255D-Central Gulf Prairies and Marshes Section

This section is flat to weakly dissected alluvial plain and includes barrier islands. Soils are marine-deposited acid sands, sandy loams, and clays; areas of wind-deposited dunes are along the coast. Vegetation is prairie and oak-hickory cover types. (Photo: National Park Service)

255E-Texas Cross Timbers and Prairies Section

The landscape varies from low hills in west to gently rolling plains in east. Rock formations are sandstones in west and calcareous sedimentary in east; soil ranges from sandy loam to clays. Vegetation is a mosaic of Texas savanna, oak-pine, oak-hickory, and Great Plains grasslands cover types.

261-California Coastal Chaparral Forest and Shrub Province

This province is characterized by a Mediterranean-like climate of mild, wet winters and hot, dry summers, with a brief period of drought. Landscape is coastal plains and high hills. Vegetation is mosaic of woodland, dwarf-woodland, and shrubland species that are evergreen and drought deciduous; many species are adapted to fire.

261A-Central California Coast Section

The terrain is low to moderate elevation parallel ranges and valleys. Bedrock is sedimentary, granitic and ultramafic formations. Vegetation is a mixture of western hardwoods, chaparral-mountain shrub, and annual grasslands cover types. (Photo: R. Ettner, USDA Forest Service)

261B-Southern California Coast Section

This section has a landscape of narrow ranges of low elevation with alluvial lowlands and coastal terraces on geologic formations of marine and nonmarine sedimentary rocks. Vegetation includes sagebrush, chaparral-mountain shrub, and western hardwoods cover types. (Photo: R. Ettner, USDA Forest Service)

262-California Dry Steppe Province

The climate of this province consists of hot summers and mild winters with precipitation occurring mostly during winter. Landscape is alluvial plains with low hills. Vegetation was originally herbaceous, but now is largely irrigated agricultural crops.

262A-Great Valley Section

This section has a low-elevation fluvial plain formed on nonmarine sedimentary rocks. Cover type is primarily agricultural; small areas of natural cover types remain that include annual grasslands, western hardwoods, and wet grasslands. (Photo: R. Ettner, USDA Forest Service)

263-California Coastal Steppe, Mixed Forest, and Redwood Forest Province

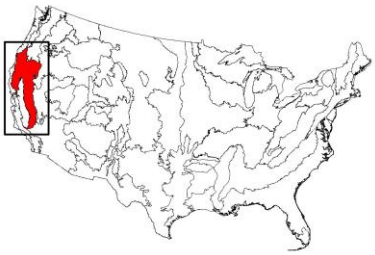
In this province, the prevailing climate is maritime, Mediterranean type of mild winters and cool summers. Winters are wet, with short period of summer drought. Dense fog is common during summer. Landscape is low mountains. Vegetation is mainly forest of very tall needleleaf, evergreen trees with smaller areas of broadleaf woodlands.

263A-Northern California Coast Section

This section has low-elevation parallel ranges with rounded crests of unequal height. Rock formations are of sedimentary origin. Vegetation is redwood, Douglas-fir, western hardwoods, and annual grasslands cover types. (Photo: D. Howell, USDA Forest Service)

M261-Sierran Steppe-Mixed Forest-Coniferous Forest-Alpine Meadow Province

Winters are cold in this province. Precipitation strongly influenced by altitude and direction of mountain ranges; most occurs during winter as snow; summers are hot and dry. This unit is one of mountainous landscape with steep slopes. Vegetation occurs in elevation-delineated zones, ranging from broadleaf-needle leaf woodland and shrublands low to needle leaf evergreen forests higher.



M261A-Klamath Mountains Section

This section is a low- to moderate-elevation uplifted and dissected peneplain. Rock formation origins are sedimentary and volcanic. Vegetation is mixed Douglas-fir, ponderosa pine, western hardwoods, and chaparral-mountain shrub cover types. (Photo: S. Miles, USDA Forest Service)

M261B-Northern California Coast Ranges Section

Mountain ranges are of a low to moderate elevation and are somewhat parallel with crests of unequal height. Rocks are mostly of volcanic origins. Vegetation consists of Douglas-fir, western hardwoods, chaparral-mountain shrub, and annual grasslands cover types. (Photo: D. Howell, USDA Forest Service)

M261C-Northern California Interior Coast Ranges Section

This section has low- to moderate-elevation parallel ranges with crests of unequal height underlain by sedimentary rocks. Vegetation is western hardwoods, chaparral-mountain shrub, and annual grasslands cover types. (Photo: R. Ettner, USDA Forest Service)

M261D-Southern Cascades Section

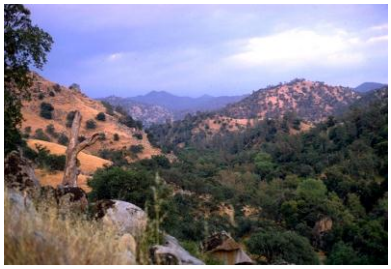
This section consists of scattered mountains of low to high elevations. Rock formations and soils are of volcanic origin. Vegetation is ponderosa pine, sagebrush, and fir-spruce cover types. (Photo: R. Ettner, USDA Forest Service)

M261E-Sierra Nevada Section

The landscape is a block-mountain range with high-elevation crests. Rock formations are mostly of metamorphosed sedimentary and volcanic origins. Forests consist of ponderosa pine, fir-spruce, and lodgepole pine, with smaller areas of sagebrush and alpine tundra cover types. (Photo: R. Ettner, USDA Forest Service)

M261F-Sierra Nevada Foothills Section

The landscape of this section is a block mountain range with low-elevation crests of similar heights. Geologic formations are a mixture of sedimentary, granitic, volcanic, and ultramafic rocks. Vegetation is mostly western hardwoods, annual grasslands, and chaparral-mountain shrub cover types. (Photo: R. Ettner, USDA Forest Service)

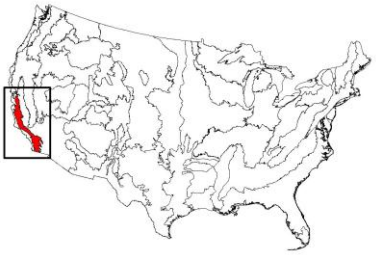


M261G-Modoc Plateau Section

This section has fault-block mountains and ridges with nonmarine sedimentary rocks and other formations of materials of volcanic origin. Vegetation is a mixture of sagebrush, ponderosa pine, and pinyon-juniper cover types. (Photo: R. Ettner, USDA Forest Service)

M262-California Coastal Range Open Woodland-Shrub-Coniferous Forest-Meadow Province

This province has a climate of hot, dry summers and mild, wet winters; most precipitation is rain. Landscape is mountains with steep slopes. Vegetation is primarily evergreen shrubland, with lesser areas of woodland, consisting of broadleaf species, some of which are drought-deciduous.



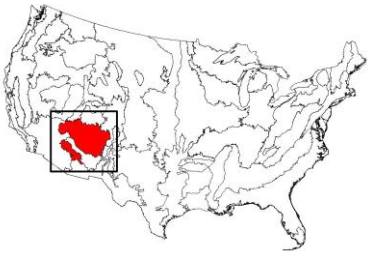
M262A-Central California Coast Ranges Section

The landscape of this section is low-elevation parallel ranges. Rock formations are marine and nonmarine sedimentary origins. Vegetation is western hardwoods, annual grasslands, and chaparral-mountain shrub cover types. (Photo: R. Ettner, USDA Forest Service)

M262B-Southern California Mountain and Valley Section

The landscape is moderate-elevation narrow ranges and broad fault blocks. Granitic formations are beneath the uplands with areas of marine and nonmarine sedimentary rocks elsewhere. Vegetation consists of chapparal-mountain shrub, western hardwoods, ponderosa pine, and fir-spruce cover types. (Photo: R. Ettner, USDA Forest Service)

313-Colorado Plateau Semidesert Province



This province has a modified continental climate of cold winters and summers with rains from thunderstorms. More than half of precipitation occurs during winter. Province is mostly tablelands with moderate to high relief. Vegetation varies by altitude and varies from herbaceous and dwarf-shrubland at low elevation, shrubland and woodland at moderate elevation, to needleleaf forest at upper elevations.

313A-Grand Canyon Section

This section is primarily a high-elevation plateau incised by the Colorado River forming the Grand Canyon. Landforms are mainly sheer-walled canyons, lines of cliffs, mesas, buttes, and badlands. Average precipitation slightly less than surrounding map units. Vegetation is sagebrush, pinyon-juniper, ponderosa pine, and southwestern shrubsteppe cover types. (Photo: W. Robbie, USDA Forest Service)

313B-Navaho Canyonlands Section

This section has a high-elevation plateau with occasional volcanic mountains. Major landforms consist of canyonlands, plateaus, plains, and hills. Rock formations are mostly sedimentary sandstones. Vegetation is desert grasslands, pinyon-juniper, and ponderosa pine cover types. (Photo: W. Robbie, USDA Forest Service)

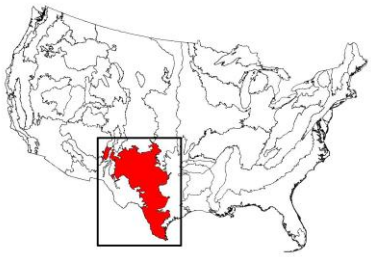
313C-Tonto Transition Section

This subregion consists of mountainous terrain that is a transition between Colorado Plateaus and Basin and Range Sections. A greater range of habitats created by varied topography is present here than for adjacent units. Vegetation consists of chaparral-mountain shrub, southwestern shrub-steppe, ponderosa pine, and pinyon-juniper cover types. (Photo: W. Robbie, USDA Forest Service)

313D-Painted Desert Section

This section consists of extensive plateaus with landforms of plains, hills, and shallow canyonlands that are underlain by sedimentary rocks. Vegetation consists of desert grasslands, pinyon-juniper, southwestern shrub-steppe, and desert shrub cover types. (Photo: W. Robbie, USDA Forest Service)

315-Southwest Plateau and Plains Dry Steppe and Shrub Province



A cool, continental steppe and semiarid climate characterize sections 315A and 315B; other sections have a warm, modified marine subhumid climate. Most precipitation falls during the growing season, but is less than potential evaporation. Vegetation is mainly herbaceous with shrubland with increasing woodland on steeper slopes.

315A-Pecos Valley Section

The landscape is varied, with plains, hills, basins, and fans. Geologic formations consist of sedimentary and volcanic rocks. More than half of annual precipitation occurs during summer growing season but low amounts and erratic patterns result in xeric to subxeric sites. Vegetation consists of desert grasslands, southwestern shrub-steppe, Great Plains grasslands, and pinyon-juniper cover types. (Photo: H. McNab, USDA Forest Service)

315B-Texas High Plains Section

This section has a relatively level, high plateau with soils mainly of clays in the north to sands in the south; usually underlain by caliche; playa lakes are common. Vegetation is mainly Great Plains grasslands cover type. Severe drought occurs periodically. (Photo: H. McNab, USDA Forest Service)

315C-Rolling Plains Section

This section has nearly flat to low north-south trending ridges that are underlain by limestones, sandstones, and shales. Soils range from coarse sands to fine clays mostly neutral to alkaline sands and clays. Vegetation is Great Plains grasslands and prairie cover types. (Photo: H. McNab, USDA Forest Service)

315D-Edwards Plateau Section

This section has a generally flat surface with box canyons, soils formed from limestones and dolomite formations with minor areas of granites; springs common in more dissected canyonland areas of east and south. Vegetation includes Texas savanna, pinyon-juniper, Great Plains grasslands, prairie, and oak-hickory cover types.

315E-Rio Grande Plain Section

This section has a level to rolling landscape of marine-deposited alkaline to acid clays and clay loams; includes coastal area of tidal influenced barrier islands and marshes. The summer climate is typically high temperatures and evaporation rates. Vegetation is Texas savanna and oak-hickory cover types.

315F-Northern Texas High Plains Section

This section has gently to moderately rolling plains dissected by narrow intermittent stream valleys. Neutral to slightly alkaline soils vary from coarse sands to clays and shales. Vegetation is shinnery and Great Plains grasslands cover types. (Photo: H. McNab, USDA Forest Service)

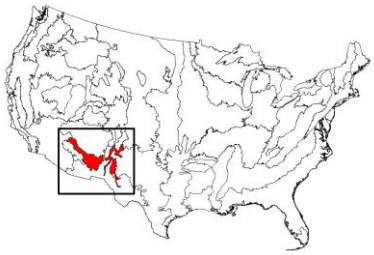
315G-Eastern Rolling Plains Section

This section has irregular plains and tablelands with little surface dissection. Bedrock geology is sandstones and limestone. Soils are droughty clays and sands. Vegetation includes oak-hickory and prairie cover types.

315H-Central Rio Grande Intermontane Section

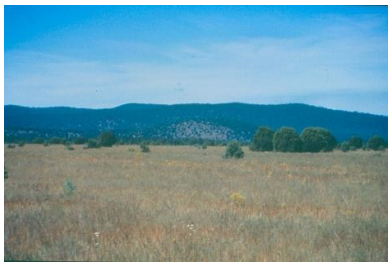
This subregion is a large intermountain riverine basin with valleys, lowland and outwash plains, and alluvial fans and terraces. Bedrock is mainly sedimentary formations with some volcanics. Vegetation is mostly sagebrush, pinyon-juniper, and ponderosa pine cover types. (Photo: National Park Service)

M313-Arizona-New Mexico Mountains Semidesert-Open Woodland-Coniferous Forest-Alpine Meadow Province



This province has a cool to cold climate with most precipitation occurring during late summer (as thunderstorms) and early winter. Landscape is mostly steep foothills and mountains. Vegetation varies by zones of altitude and, from low to high elevations, ranges from herbaceous and shrubland, woodland, to forest.

M313A-White Mountains-San Francisco Peaks-Mongollon Rim Section

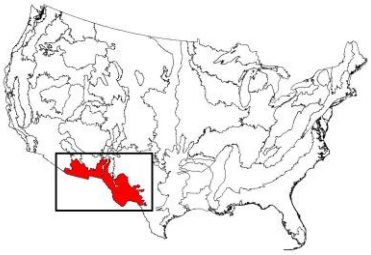


This section has a plateau with plains, hills, and mountains of moderate to high elevations. Formations are mostly volcanic igneous origins with some sedimentary rocks. Forest vegetation is ponderosa pine, pinyon-juniper, and desert grasslands cover types. (Photo: W. Robbie, USDA Forest Service)

M313B-Sacramento-Monzano Mountains Section

This section has a landscape of moderate-elevation mountains, hills, plains, and scarps. Rocks are sedimentary and igneous origins. Vegetation consists of pinyon-juniper and southwestern shrub-steppe cover types. (Photo: R. Nichols, USDA Forest Service)

321-Chihuahuan Semidesert Province



This province has a subtropical arid climate of short winters and long, hot summers and includes isolated embedded areas of mountain climates of cooler temperatures, lower relative humidity, and increased orographic precipitation. Most precipitation occurs during mid to late summer, mainly as thunderstorms that cause rapid runoff. Vegetation is almost entirely dwarf-shrubland and sparse coverage, although small areas of woodland do occur on higher mountains.

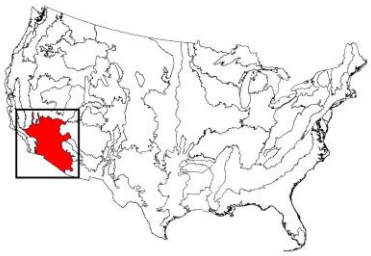
321A- Basin and Range Section

This landscape consists of plains and tablelands with hills and low mountains presenting a pattern of alternating basins and ranges. Rock formations are mostly volcanic with areas of marine deposits. Vegetation is mixture of southwestern shrub-steppe, chaparral-mountain shrub, and desert shrub cover types. (Photo: W. Robbie, USDA Forest Service)

321B-Stockton Plateau Section

This subregion is characterized by higher base elevation than surrounding units; dissected, mesa-formed terrain underlain by unfaulted, near-horizontal beds of carbonate and alluvial sediments. Vegetation is southwestern shrub-steppe and Great Plains grasslands cover types.

322-American Semidesert and Desert Province



This province has a climate of long, hot summers and mild winters with little precipitation, although some occurs as summer thunderstorms. Landscape, parts of which are below sea level, consists of plains with low mountain ranges. Vegetation is sparse and consists mainly of dwarf-shrubland, with occasional shrubland and woodland at higher elevation.

322A-Mojave Desert Section

The terrain consists of plains with short mountain ranges, playas, basins, and dunes. Parts of this section (Death Valley) are below sea level. Soils formed in sedimentary and granitic rocks and alluvial deposits; some areas are affected by high salt content. Vegetation consists of desert shrub, pinyon-juniper, and, on high peaks, small areas of fir-spruce cover types. (Photo: C. Goudey, USDA Forest Service)

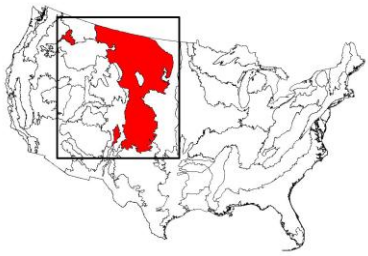
322B-Sonoran Desert Section

This section consists of plains with widely separated short mountain ranges of low elevations. Rocks are mainly nonmarine sedimentary origin with some granitics. Vegetation is desert shrub cover type. (Photo: W. Robbie, USDA Forest Service)

322C-Colorado Desert Section

The landform is mainly a plain. Areas of alluvial deposits are present that are associated with the changing shoreline of the Salton Sea, which lies 230 feet below sea level. Geologic formations are primarily sedimentary. Vegetation is desert shrub cover type. (Photo: C. Goudey, USDA Forest Service)

331-Great Plains-Palouse Dry Steppe Province



The climate in this province is continental steppe, semiarid with cold dry winters and hot summers. Landforms consist of plains and tablelands. Potential evaporation exceeds precipitation. Vegetation is predominantly herbaceous with lesser areas of shrubland.

331A-Palouse Prairie Section

This area has a slight marine influence from the Pacific Ocean and characterized by warm temperate climate of hot, dry summers and cool, moist winters. Landscape is low- to high-relief rolling hills and silt dunes. Deep soils have formed in loess originating from glacial outwash plains. Vegetation once consisted mostly of mountain grasslands with some ponderosa pine cover types; now is largely agricultural, primarily wheat. (Photo: USDA Agricultural Research Service)

331B-Southern High Plains Section

This subregion is a high plateau with flat terrain. Soils formed in eolian silts and fine sands; playa lakes present. Predominant vegetation is Great Plains grasslands and pinyon-juniper cover types. (Photo: K. Grove, USDA Forest Service)

331C-Central High Tablelands Section

This subregion has smooth loess-covered tablelands with gently rolling slopes and large valleys bordered by steep slopes. Formations are sandstones, siltstones, conglomerates and windblown dune sands and loess. Current vegetative cover is agricultural production; historic vegetation was Great Plains grasslands and prairie cover types. (Photo: J. Freeouf, USDA Forest Service)

331D-Northwestern Glaciated Plains Section

This section has level to gently rolling continental glacial till plains and rolling hills with knob and kettle topography. Soils formed in glacial drift up to 100 feet thick overlying marine shale. Vegetation is Great Plains grasslands and mountain grasslands cover types. (Photo: U.S. Fish & Wildlife Service)

331E-Northeastern Glaciated Plains Section

This area has gently undulating to rolling continental glacial till plains with areas of kettle holes, kames, and moraines. Till is underlain by nonmarine sedimentary rocks. Current vegetation consists mostly of agricultural production; historic natural vegetation was Great Plains grasslands cover type. (Photo: National Park Service)

331F-Western Great Plains Section

This subregion has gently sloping to rolling, moderately dissected shale plains with areas of steep, flat-topped buttes and badlands with eroded escarpments. Soils formed in soft, nonmarine sedimentary rocks. Vegetation is Great Plains grasslands and ponderosa pine cover types. (Photo: J. Freeouf, USDA Forest Service)

331G-Powder River Basin Section

This section includes a variety of landforms: gently rolling to steep dissected plains; flat-topped, steep-sided buttes; and steeply sloping badlands along some large river valleys. Soils formed from nonmarine sedimentary rocks; some glacial lake beds occur. Vegetation includes Great Plains grasslands, ponderosa pine, and sagebrush cover types.

331H-Central High Plains Section

The landscape of this section has undulating to rolling plains, moderately dissected by streams. Geologic formations are variable and include areas of claystones, sandstones, limestones, and windblown dune sand, silt, and loess. Vegetation is Great Plains grasslands and prairie cover types. (Photo: G. Kramer, USDA Natural Resources Conservation Service)

331I-Arkansas Tablelands Section

The landscape of this section has undulating to rolling plains, moderately dissected by streams. Geologic formations are mostly shales with areas of sandstones, siltstones, limestones, windblown dune sands, and a small area of basalt. Vegetation is Great Plains grasslands and pinyon-juniper cover types. (Photo: J. Freeouf, USDA Forest Service)

331J-Northern Rio Grande Basin Section

This section consists of elevated plains and hills with included valleys and lowlands. Rocks are of sedimentary and volcanic origins. Vegetation includes pinyon-juniper, ponderosa pine, chaparral-mountain shrub, and desert shrub cover types. (Photo: J. Freeouf, USDA Forest Service)

331K-North Central Highlands Section

This section is an unglaciated plain with many small intermittent streams; also present are areas of scattered hills and plains with eroded buttes. Geologic formations are sedimentary shales that weather to form soils having high clay content. Vegetation consists of Great Plains grasslands and ponderosa pine cover types. (Photo: J. Freeouf, USDA Forest Service)

331L-Glaciated Northern Grasslands Section

This section is a dissected, glaciated plain. Soils have formed in glacial till and alluvial areas of larger valleys. Vegetation is mostly Great Plains grasslands cover type. (Photo: Bowdoin National Wildlife Refuge, U.S. Fish & Wildlife Service)

331M-Missouri Plateau Section

This section has mostly moderately dissected, unglaciated flat to slightly rolling plains with areas of badlands. Sandstones with some small areas of shales and coal form the geologic substrate. Vegetation includes Great Plains grasslands and ponderosa pine cover types. (Photo: National Park Service)

331N-Belt Mountains Section

This section consists of rugged, high-elevation mountains with lower foothills of hilly terrain. Geologic formations are mainly limestones, which differs from adjacent subregions, with small areas of igneous rocks. Vegetation is Great Plains grasslands and mountain grasslands cover types.

332-Great Plains Steppe Province

This province has a dry, continental climate with cool to cold winters; precipitation is about half of potential evapotranspiration. Landscape consists of plains and low hills of gentle relief. Vegetation is predominantly herbaceous with woodland along riparian areas of waterways.

332A-Northeastern Glaciated Plains Section

This section has level to undulating continental glacial till and glacial lake plains with areas of kettle holes, kames, and moraines. Soils formed in glacial till underlain by marine sedimentary rocks. A characteristic ecological feature of this subregion is presence of prairie potholes. Existing cover type is mainly agricultural. Small areas of natural cover types remain consisting of Great Plains grasslands and aspen-birch cover types.

332B-Western Glaciated Plains Section

The landscape of this section consists of level to undulating continental glacial till plains with glacial features, including lake plains and moraines. Soils formed in glacial till underlain by marine sedimentary rocks. Prairie potholes occur in this section. Current vegetation is largely agricultural cultivation. Historic vegetation was Great Plains grasslands with aspen-birch along major drainages. (Photo: D. Poggense, USDA Natural Resources Conservation Service)

332C-Nebraska Sand Hills Section

This semiarid subregion has rolling to steep irregular sand dunes separated by narrow, elongated, gently rolling, sloping valleys. Bedrock formations are sandstones and shales that are covered by deep, windblown dune sands. Soils are well- to excessively drained sands; flowing water generally lacking although present in larger valleys as small lakes or streams where aquifer is near the surface. Original vegetation was treeless prairie and Great Plains grasslands cover types, with aspen-birch along larger waterways, but now cultivated, irrigated, and pastured for livestock. Ecosystem is drier than adjoining units. (Photo: J. Loftis, Greeley, Colorado)

332D-North Central Great Plains Section

This section has level to gently rolling till plains with potholes and well-defined dendritic drainage system. Geologic formations are mostly marine shales with occasional sandstones. Current vegetation is mostly agricultural; historic vegetation was Great Plains grasslands and aspen-birch cover types. (Photo: D. Steinke, USDA Forest Service)

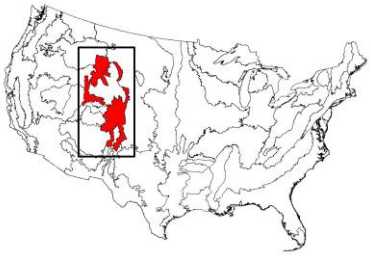
332E-South Central Great Plains Section

This section consists of dissected plains with broad rolling ridge tops and moderately steep valley sides. Soils formed in thick layer of windblown sand and sandy outwash. Current vegetation consists of agricultural production; historic vegetation included Great Plains grasslands, prairie, and aspen-birch cover types. (Photo: D. Steinke, USDA Forest Service)

332F-South Central and Red Bed Plains Section

This subregion has dissected and somewhat hilly to rolling plains. Rock formations are mostly sedimentary sandstones with large area of red shale that weathers easily and smaller areas of wind-deposited loess and sands. Small grain agricultural production (wheat) has largely replaced natural vegetation of Great Plains grasslands cover types. (Photo: National Park Service)

M331-Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Province



The climate of this ecoregion is modified continental with short, warm summers and long, cold winters. Precipitation is moderate and increases considerably with altitude where much occurs as snow. Topography is high mountains of steep, little-weathered slopes. Vegetation is mainly evergreen, needleleaf forest that varies in composition with altitude and aspect.

M331A-Yellowstone Highlands Section

The landscape of this area includes high, rugged mountains with rounded ridges, cirques, and broad valleys. Much of the area has been glaciated. Rocks are of volcanic origin and consist of rhyolites, tuffs, and mafic basalts. Vegetation includes lodgepole pine, fir-spruce, sagebrush, and alpine tundra cover types. (Photo: K. Houston, USDA Forest Service)

M331B-Bighorn Mountains Section

This section has high mountains with sharp crests, rolling uplands, and dissected hills; narrow valleys cut the uplands. Soils formed in gneiss, carbonate, and shale rocks. Soils are shallow to moderately deep and of coarse texture. Vegetation is a combination of fir-spruce, lodgepole pine, sagebrush, and small areas of alpine tundra cover types at the highest elevations. (Photo: J. Nesser, USDA Forest Service)

M331D-Overthrust Mountains Section

This section has steep, rugged mountains of high elevation with narrow to broad valleys that rise abruptly from adjacent plains. Rocks are sedimentary limestones, siltstones, cherts, sandstones, and shales. Vegetation is mostly lodgepole pine, fir-spruce, and sagebrush, with small areas of alpine tundra cover types. (Photo: J. Freeouf, USDA Forest Service)

M331E-Uinta Mountains Section

This section is a somewhat unique, east-west high-elevation mountain range with a dry climatic regime. Winter snow has relatively little water content. Geologic substrate is particularly varied in composition and ages, which date back to early Precambrian; quartzite and limestone formations are present. Vegetation is lodgepole pine, fir-spruce, sagebrush, and alpine tundra cover types. (Photo: C.C. McNab, Weaverville, North Carolina)

M331F-Southern Parks and Rocky Mountain Range Section

The landscape of this section includes high mountains with valley plains. Geologic formations are variable and include rocks of igneous, metamorphic, and sedimentary origin. Vegetation includes ponderosa pine, pinyon-juniper, and alpine tundra cover types. (Photo: J. Freeouf, USDA Forest Service)

M331G-South Central Highlands Section

This section has steeply sloping, sharp-crested mountains dissected by many narrow stream valleys; high plateaus with steep-walled canyons are common. Soils formed about equally in areas of (1) volcanic ash flows and lavas and (2) sandstones, siltstones, shales, and carbonates. Vegetation is fir-spruce, ponderosa pine, and alpine tundra cover types. (Photo: J. Freeouf, USDA Forest Service)

M331H-North Central Highlands and Rocky Mountains Section

This section has steeply sloping to precipitous flat-topped mountains dissected by narrow stream valleys. Soils are formed from rocks that include carbonates, sandstones, siltstones, and shales. Vegetation is a mosaic of chaparral-mountain shrub, fir-spruce, and alpine tundra cover types. (Photo: J. Freeouf, USDA Forest Service)

M331I-Northern Parks and Ranges Section

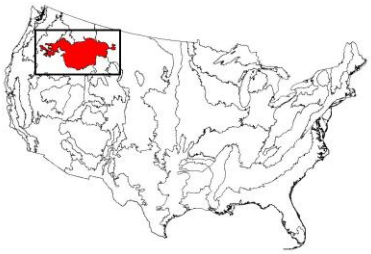
This section of variable topography consists of high mountains, gently rolling parks and valleys, hills, and low mountains. Rocks in most of the area are gneisses of various compositions. Vegetation is varied and includes lodgepole pine, ponderosa pine, alpine tundra, sagebrush, and hemlock-Sitka spruce cover types. (Photo: J. Freeouf, USDA Forest Service)

M331J-Wind River Mountains Section

This section is characterized by high-elevation, glaciated mountains. Rocks are mostly granites with small areas of metasedimentary formations. Vegetation is lodgepole pine and fir-spruce cover types. (Photo: A. Youngblood, USDA Forest Service)

M332-Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province

This province has a maritime-influenced temperate climate with warm, dry summers and cool to cold, moist winters. Most precipitation occurs during fall, winter, and spring as snow. Dominant landforms are mountains of moderate elevations. Vegetation is mainly evergreen, needleleaf forest that varies in composition with altitude, although lower slopes and plains are dominated by shrubland and herbaceous cover.



M332A-Idaho Batholith Section

The batholith section is a large, contiguous uplifted area of granitic plutons characterized by large, mountain masses and basin areas. Soils formed in gruss, loess, and volcanic ash. Part of the section is deeply cut by the Idaho canyonlands. Mountain glaciation occurred at higher elevations. Forest vegetation consists of Douglas-fir, lodgepole pine, and sagebrush cover types. (Photo: J. Freeouf, USDA Forest Service)

M332B-Northern Rockies and Bitterroot Valley Section

This subregion consists of high, glaciated mountains with narrow valleys. Soils formed in weathered granite and metasedimentary rock formations. Vegetation is lodgepole pine, mountain grasslands, and Douglas-fir cover types. (Photo: J. Nesser, USDA Forest Service)

M332D-Belt Mountains Section

This subregion consists of high mountains with associated intermontane valleys; some areas of plains and rolling hills. Soils formed in soft sedimentary rocks. Vegetation includes mountain grasslands and Douglas-fir cover types. (Photo: J. Freeouf, USDA Forest Service)

M332E-Beaverhead Mountains Section

The landscape of this section is complex; it has high, steep mountains with sharp alpine ridges, glacial and fluvial valleys, and flood plains. Soils formed in sedimentary and volcanic rocks. Vegetation consists of sagebrush, lodgepole pine, and Douglas-fir cover types. (Photo: A. Greene, USDA Forest Service)

M332F-Challis Volcanics Section

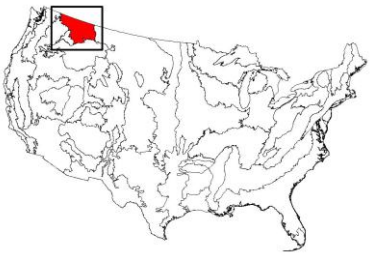
This section consists of mid- to high-elevation, sharp-crested mountains. Rock formations are mostly of volcanic origin, with small areas of granites and quartzite. Vegetation is Douglas-fir, lodgepole pine, and sagebrush cover types. (Photo: J. Freeouf, USDA Forest Service)

M332G-Blue Mountains Section

The landscape of this section mostly is moderately dissected, wide, uplifted plateau with mesas and buttes separated by wide, low-elevation canyons. Geologic formations are varied and include volcanic tuffs, basalts, and accreted terrains. Vegetation is varied and includes ponderosa pine, fir-spruce, lodgepole pine, sagebrush, and larch cover types. (Photo: A. Youngblood, USDA Forest Service)

M333-Northern Rocky Mountain Forest-Steppe-Coniferous Forest-Alpine Meadow Province

This province has a maritime-influenced cool temperate climate with warm, dry summers and cold, moist winters with heavy snowfall. Small areas of glaciers occur near the Canadian border. High-elevation, high-relief mountains are the main landforms. Vegetation is mainly evergreen and deciduous, needleleaf forest that varies in composition with altitude and aspect.



M333A-Okanogan Highland Section

The landscape of this section is dominated by rounded landforms that resulted from continental glaciation. Till deposits, often 50 to 100 feet thick, cover mountainsides and valley floors. A mantle of loess and volcanic ash occurs over most of the glacial deposits. Vegetation includes western white pine, larch, Douglas-fir, and mountain grasslands cover types. (Photo: Colville National Forest, USDA Forest Service)

M333B-Flathead Valley Section

The landscape of this section is one of glaciated mountains, glacial moraines, troughs, and basins. Rocks are metasedimentary with glacial deposits. Dominant vegetation is larch, hemlock-Sitka spruce, western white pine, and fir-spruce cover types. (Photo: J. Nesser, USDA Forest Service)

M333C-Northern Rockies Section

The landscape of this section includes high, steep, glaciated overthrust mountains with sharp alpine ridges. Rocks consist of metasedimentary and sedimentary formations with glacial deposits. Vegetation includes lodgepole pine, fir-spruce, larch, and mountain grasslands cover types. (Photo: National Park Service)

M333D-Bitterroot Mountains Section

This section has steep dissected mid- to high-elevation mountains with metasedimentary geologic composition. Vegetation is mountain grasslands, lodgepole pine, and Douglas-fir cover types.

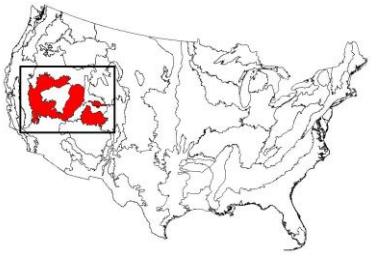
M334-Black Hills Coniferous Forest Province

The climate of this province is characterized by relatively long, cold winters and warm to hot summers. Annual precipitation is low and occurs mostly as snow. Ecoregion is a highly eroded, old, isolated, unglaciated large mountain dome of Precambrian origin that is surrounded by plains. Vegetation is forests mostly of evergreen needleleaf species although several deciduous broadleaf species common to more northern latitudes may be present.

M334A-Black Hills Section

This subregion consists of central highland core area surrounded by a plateau that is banded by foothills and a hogback. Rock formations are patterned and include granitic peaks, surrounded by a high limestone plateau, which is bordered by sandy shales with sandstones next to the plains. Vegetation is mostly ponderosa pine and Great Plains grasslands cover types. This unit is wetter and cooler than the surrounding plains. (Photo: K. Grove, USDA Forest Service)

341-Intermountain Semidesert and Desert Province



This province has a climate of hot summers and cool to cold winters. Low annual precipitation, most of which occurs as snow. Basin and range types of topography. Vegetation consists of shrubland on plains; woodlands are on steeper slopes.

341A-Bonneville Basin Section

This section consists of north-south trending mountains separated by broad, sediment-filled valleys; mountains formed by faulting. Volcanic formations are dominant rocks, with mud and salt flats. Vegetation includes desert shrub, pinyon-juniper, sagebrush, and chaparral-mountain shrub cover types. (Photo: H. McNab, USDA Forest Service)

341B-Northern Canyonlands Section

This subregion has deep sheer-walled canyons, cliff lines, low plateaus, mesas, buttes, and badlands. Shales and sandstones are major rocks with smaller eolian deposits. Vegetation consists of desert shrub, pinyon-juniper, desert grasslands, and ponderosa pine cover types. (Photo: J. Freeouf, USDA Forest Service)

341C-Uinta Basin Section

This section consists of large, synclinal basin overlying sedimentary (sandstone) rocks, with some glacial deposits. Vegetation is mostly desert shrub and pinyon-juniper cover types. (Photo: H. McNab, USDA Forest Service)

341D-Mono Section

This section has isolated ranges of mid-elevation, largely dissected block mountains separated by desert plains. Rocks are mostly of volcanic origin with some sedimentary and granitics. Vegetation consists mostly of sagebrush, desert shrub, and pinyon-juniper cover types, with small areas of fir-spruce on high peaks. (Photo: USDA Forest Service)

341E-Northern Mono Section

This section has a landscape of low- to mid-elevation, block-faulted, upthrusted north-south trending mountains interspersed with playas. Rocks are granitics. Vegetation includes desert shrub, sagebrush, and chaparral-mountain shrub cover types. (Photo: Bureau of Land Management)

341F-Southeastern Great Basin Section

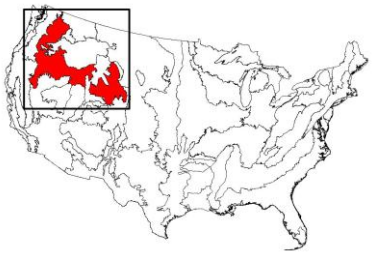
In this section, mountains are of moderate elevation and are separated by broad, sediment-filled valleys. Rock formations are mostly of volcanic origin. Vegetation consists of sagebrush, desert shrub, pinyon-juniper, and chaparral-mountain shrub cover types. (Photo: Toiyabe National Forest, USDA Forest Service)

341G-Northeastern Great Basin Section

This subregion consists of mid- to high-elevation mountains with broad, sediment-filled valleys. Soils formed in rock formations of quartzites, dolomites, cherts, shales, and siltstones. Vegetation is mostly sagebrush cover types. (Photo: H. McNab, USDA Forest Service)

342-Intermountain Semidesert Province

This province has a semiarid, cold continental climate with warm to hot, dry summers and cold, dry winters. Climatic regime is one with little or no precipitation during summer or fall. Topography consists of plains and plateaus with isolated small mountain ranges. Vegetation is herbaceous and dwarf-shrubland on plains, which changes to shrubland and woodland on higher slopes.



342A-Bighorn Basin Section

The unglaciated plains of this section are typically gently rolling, low-relief hills and badlands. Bedrock is marine shales, fluvial sediments, and some large sandstone units. Vegetation consists of sagebrush and desert shrub cover types. (Photo: USDA Forest Service)

342B-Northwestern Basin and Range Section

This section has nearly level basins and valleys bordered by long, gently sloping alluvial fans with linear mountain ranges. Soils are formed mostly from rocks of volcanic origin. Vegetation consists of sagebrush and desert shrub cover types. (Photo: H. McNab, USDA Forest Service)

342C-Owyhee Uplands Section

This section consists largely of a nearly flat, deeply dissected plateau, where block-faulted mountain ranges are less pronounced than in other parts of the Basin and Range physiographic province to the south. Annual rainfall averages from 4 to 8 inches. Unlike the Basin and Range province, however, drainage is not internal and erosion by surface streams has formed steep-walled, deep canyons. Rock formations are mostly volcanic tuffs and basalts, with some granites. Soils on plains are generally shallow and clayey, but are deeper and loamy on slopes. The main vegetation consists of sagebrush and pinyon-juniper cover types. (Photo: Bureau of Land Management)

342D-Snake River Basalts and Basins Section

This section consists of nearly level sheets of basalt that form a large plain. Soils have formed mainly from basalts, cinders, and wind-blown material. Vegetation consists largely of sagebrush and desert shrub cover types. (Photo: J. Freeouf, USDA Forest Service)

342E-Bear Lake Section

This subregion consists of gently rolling, hilly terrain with lesser areas of steep mountains, with broad linear valleys, around Bear Lake. Rocks are mostly sedimentary, although some lacustrine deposits occur. Vegetation is a combination of sagebrush and chaparral-mountain shrub cover types. (Photo: H. McNab, USDA Forest Service)

342F-Central Basin and Hills Section

The landscapes of this section are medium to high mountain ranges that rise sharply from basins with rugged hills and narrow valleys. Sedimentary rocks are dominant, although volcanics occur also. Vegetation is a combination of sagebrush and Great Plains grasslands cover types. (Photo: J. Freeouf, USDA Forest Service)

342G-Green River Basin Section

The physiography of this section is a landscape of rugged hills and low mountains with narrow valleys having steep gradients and broad intermountain basins. Sedimentary rock formations underlie most of the region. Vegetation includes sagebrush, pinyon-juniper, and chaparral-mountain shrub cover types. (Photo: J. Freeouf, USDA Forest Service)

342H-Blue Mountain Foothills Section

The landscape of this section is varied and consists of low to high hills, alluvial fans, canyonlands, and occasional low mountains. Geologic substrate is largely of volcanic origin and includes lava fields, ash deposits, and tuff outcrops; caves common in some areas. Vegetation is mostly sagebrush and chaparral-mountain shrub cover types; pinyon-juniper occurs on the upper slopes of some mountains.

342I-Columbia Basin Section

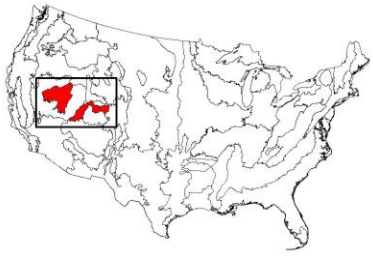
This subregion is a large, dissected, high-elevation plain with rolling hills and channeled scablands. Much of the area is covered by thick basal deposits that, in some areas, are covered by a thick layer of loess. Vegetation consists of sagebrush, mountain grasslands, and ponderosa pine cover types. (Photo: National Oceanic and Atmospheric Administration)

342J-Eastern Basin and Range Section

This section consists of dissected plains with low, rolling hills, and occasional mountain ranges of moderate to high elevations. Geologic formations include volcanic, granitic, and sedimentary sandstones. Vegetation includes sagebrush, pinyon-juniper, and Douglas-fir cover types. (Photo: National Park Service)

M341-Nevada-Utah Mountains Semidesert-Coniferous Forest-Alpine Meadow Province

This province has a climate characterized by long, cold winters and warm, dry summers. Most precipitation occurs as winter snow with little during summer, although occasional thunderstorms may occur. Landforms are mostly high plateaus with uplifted, linear high-elevation mountain ranges. Vegetation is stratified by altitude, ranging from herbaceous and dwarf-shrubland on plateaus to woodlands at middle slopes and needleleaf evergreen forests on higher mountain slopes.



M341A-East Great Basin and Mountains Section

The landscape of this subregion consists of north-south trending mountains separated by broad, sediment-filled valleys. Geologic formations are mostly volcanic and sedimentary rocks with smaller areas of igneous rocks and sand dunes. Vegetation consists of sagebrush, pinyon-juniper, and chaparral-mountain shrub cover types. (Photo: H. McNab, USDA Forest Service)

M341B-Tavaputs Plateau Section

The landscape of this section is a high-elevation plateau. Rock formations are mostly sedimentary shales, sandstones, and siltstones. Vegetation is largely pinyon-juniper, chaparral-mountain shrub, and sagebrush cover types. (Photo: C.C. McNab, Weaverville, North Carolina)

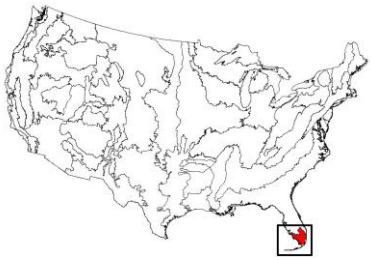
M341C-Utah High Plateau Section

The landscape of this section is high-elevation plateaus with large, steep-sided canyons. Formations are mostly volcanic and sedimentary rocks. Vegetation is a combination of pinyon-juniper, desert shrub, western hardwoods, ponderosa pine, and Douglas-fir cover types. (Photo: A. Youngblood, USDA Forest Service)

M341D-West Great Basin and Mountains Section

This section has moderate- to high-elevation mountain ranges separated by rolling to hilly valleys. Soils formed mainly in volcanic and granitic formations, although localized sandstones and carbonate rocks occur. Vegetation consists of sagebrush, chaparral-mountain shrub, and desert shrub cover types. (Photo: C.C. McNab, Weaverville, North Carolina)

411-Everglades Province



The climate of this ecoregion is characterized by rainy, hot, humid subtropical maritime climate where winter freezing temperatures are rare. Precipitation is abundant, with more than half occurring between June and September. Frequent disturbance results from subtropical hurricanes and occasional fires during the winter dry season. Vegetation consists largely of herbaceous species on the lowest, often inundated plains, although evergreen broadleaf species occur at slightly higher (several feet) elevation; evergreen needleleaf woodlands and shrublands occupy better-drained soils.

411A-Everglades Section

This section is a level plain that is shallowly inundated during most years with slowly flowing, nonsaline water from sections to the north. Extensive swamps of brackish, tidal water are present along southern and western coasts. Shallow organic soils have formed over bedrock of oolitic limestone. Vegetation consists mainly of wet grasslands and oak-gum-cypress cover types in poorly drained areas with longleaf-slash pine cover type where soils are better drained. Much of this section differs from surrounding units by having continually saturated soils. (Photo: Everglades National Park, National Park Service)

Appendix A. Areas of Subregions

Approximate areas and proportionate extent of ecoregions at the province level and subregions at the section level in the conterminous United States.

Province	Section	Area	Extent in province	Extent in U.S.
		miles^2	percent	percent
211		52,703		1.75
	211A-Aroostook Hills and Lowlands	3,890	7.4	
	211B-Maine-New Brunswick Foothills...	5,076	9.6	
	211C-Fundy Coastal and Interior	2,393	4.5	
	211D-Central Maine Coastal and Embayment	5,994	11.4	
	211E-St. Lawrence and Champlain Valley	5,617	10.7	
	211F-Northern Glaciated Allegheny Plateau	14,881	28.2	
	211G-Northern Unglaciated Allegheny Plateau	7,206	13.7	
	211I-Catskill Mountains	3,623	6.9	
	211J-Tug Hill Plateau-Mohawk Valley	4,021	7.6	
212		100,917		3.35
	212H-Northern Lower Peninsula	17,784	17.6	
	212J-Southern Superior Uplands	3,187	3.2	
	212K-Western Superior Uplands	8,003	7.9	
	212L-Northern Superior Uplands	9,552	9.5	
	212M-Northern Minnesota and Ontario	8,292	8.2	
	212N-Northern Minnesota Drift and Lake Plains	13,116	13.0	
	212Q-North Central Wisconsin Uplands	5,679	5.6	
	212R-Eastern Upper Peninsula	7,065	7.0	
	212S-Northern Upper Peninsula	4,135	4.1	
	212T-Northern Green Bay Lobe	7,824	7.8	
	212X-Northern Highlands	11,415	11.3	
	212Y-Southwest Lake Superior Clay Plain	2,121	2.1	
	212Z-Green Bay-Manitowac Upland	2,743	2.7	
M211		37,691		1.25
	M211A-White Mountains	16,296	43.2	
	M211B-New England Piedmont	6,636	17.6	
	M211C-Green, Taconic, Berkshire Mountains	5,432	14.4	
	M211D-Adirondack Highlands	9,327	24.8	
221		101,901		3.39
	221A-Lower New England	22,199	21.8	
	221B-Hudson Valley	4,929	4.8	
	221D-Northern Appalachian Piedmont	11,999	11.9	
	221E-Southern Unglaciated Allegheny Plateau	32,238	31.6	
	221F-Western Glaciated Allegheny Plateau	11,827	11.6	
	221H-Northern Cumberland Plateau	11,740	11.5	
	221J-Central Ridge and Valley	6,968	6.8	
222		141,756		4.71

	222H-Central Till Plains-Beech-Maple	28,852	20.5	
	222I-Erie and Ontario Lake Plain	10,332	7.3	
	222J-South Central Great Lakes	23,289	16.4	
	222K-Southwestern Great Lakes Morainal	17,330	12.2	
	222L-North Central U.S. Driftless and Escarpment...	19,442	13.7	
	222M-Minnesota and Northeast Iowa Morainal...	23,687	16.7	
	222N-Lake Agassiz-Aspen Parklands	4,538	3.2	
	222R-Wisconsin Central Sands	3,390	2.4	
	222U-Lake Whittlesey Glaciolacustrine Plain	10,896	7.7	
223		119,603		3.97
	223A-Ozark Highlands	49,493	39.7	
	223B-Interior Low Plateau-Transition Hills	5,461	4.6	
	223D-Interior Low Plateau-Shawnee Hills	13,281	11.1	
	223E-Interior Low Plateau-Highland Rim	24,247	20.3	
	223F-Interior Low Plateau-Bluegrass	12,287	10.3	
	223G-Central Till Plains-Oak Hickory	16,835	14.1	
M221		65,171		2.17
	M221A-Northern Ridge and Valley	26,581	40.8	
	M221B-Allegheny Mountains	010,320	15.8	
	M221C-Northern Cumberland Mountains	11,040	16.9	
	M221D-Blue Ridge Mountains	17,230	26.4	
M223		6,536		0.22
	M223A-Boston Mountains	6,536	100	
231		181,738		6.04
	231A-Southern Appalachian Piedmont	30,461	16.8	
	231B-Coastal Plains-Middle	30,188	16.6	
	231C-Southern Cumberland Plateau	8,861	4.9	
	231D-Southern Ridge and Valley	8,136	4.5	
	231E-Mid Coastal Plains-Western	35,299	19.4	
	231G-Arkansas Valley	9,679	5.3	
	231H-Coastal Plains-Loess	26,307	14.5	
	231I-Central Appalachian Piedmont	32,806	18.1	
232		216,403		7.19
	232A-Northern Atlantic Coastal Plain	7,642	3.5	
	232B-Gulf Coastal Plains and Flatwoods	43,495	20.1	
	232C-Atlantic Coastal Flatwoods	30,215	14.0	
	232D-Florida Coastal Lowlands-Gulf	10,247	4.7	
	232E-Louisiana Coastal Prairies and Marshes	15,690	7.2	
	232F-Coastal Plains and Flatwoods-Western Gulf	20,037	9.3	
	232G-Florida Coastal Lowlands-Atlantic	10,130	4.7	
	232H-Middle Atlantic Coastal Plains and Flatwoods	18,238	8.4	
	232I-Northern Atlantic Coastal Flatwoods	9,729	4.5	
	232J-Southern Atlantic Coastal Plains and Flatwoods	31,802	14.7	
	232K-Florida Coastal Plains Central Highlands	9,707	4.5	
	232L-Gulf Coastal Lowlands	9,468	4.4	
234		41,348		1.37
	234A-Southern Mississippi Alluvial	9,363	22.6	

	234C-Atchafalaya and Red River Alluvial Plains	4,648	11.2	
	234D-White and Black River Alluvial Plains	22,467	54.3	
	234E-Arkansas Alluvial Plains	4,870	11.8	
M231		11,177		0.37
	M231A-Ouachita Mountains	11,177	100	
242		12,367		0.41
	242A-Puget Trough	6,620	53.5	
	242B-Willamette Valley	5,747	46.5	
M242		54,479		1.81
	M242A-Oregon and Washington Coast Ranges	16,262	29.8	
	M242B-Western Cascades	17,315	31.8	
	M242C-Eastern Cascades	9,786	18.0	
	M242D-Northern Cascades	11,117	20.4	
251		199,235		6.62
	251A-Red River Valley	13,421	6.7	
	251B-North Central Glaciated Plains	49,598	24.9	
	251C-Central Dissected Till Plains	65,064	32.7	
	251D-Central Till Plains and Grand Prairies	23,961	12.0	
	251E-Osage Plains	16,878	8.5	
	251F-Flint Hills	10,145	5.1	
	251H-Nebraska Rolling Hills	20,166	10.1	
255		94,811		3.15
	255A-Cross Timbers and Prairies	32,489	34.3	
	255B-Blackland Prairies	13,578	14.3	
	255C-Oak Woods and Prairies	20,102	21.2	
	255D-Central Gulf Prairies and Marshes	14,425	15.2	
	255E-Texas Cross Timbers and Prairies	14,217	15.0	
261		10,370		0.34
	261A-Central California Coast	5,138	49.5	
	261B-Southern California Coast	5,232	50.5	
262		18,884		0.63
	262A-Great Valley	18,884	100.0	
263		6,323		0.21
	263A-Northern California Coast	6,323	100.0	
M261		67,199		2.23
	M261A-Klamath Mountains	14,694	21.9	
	M261B-Northern California Coast Ranges	6,174	9.2	
	M261C-Northern California Interior Coast Range	2,894	4.3	
	M261D-Southern Cascades	7,137	10.6	
	M261E-Sierra Nevada	20,282	30.2	
	M261F-Sierra Nevada Foothills	7,024	10.5	
	M261G-Modoc Plateau	8,995	13.4	
M262		20,232		0.67

	M262A-Central California Coast Ranges	9,596	47.4	
	M262B-Southern California Mountain and Valley	10,636	52.6	
313		82,399		2.74
	313A-Grand Canyon	30,557	37.1	
	313B-Navaho Canyonlands	26,071	31.6	
	313C-Tonto Transition	11,812	14.3	
	313D-Painted Desert	13,960	16.9	
315		168,333		5.59
	315A-Pecos Valley	16,442	9.8	
	315B-Texas High Plains	41,129	24.4	
	315C-Rolling Plains	32,220	19.1	
	315D-Edwards Plateau	22,312	13.2	
	315E-Rio Grande Plain	31,044	18.4	
	315F-Northern Texas High Plains	13,463	8.0	
	315G-Eastern Rolling Plains	7,857	4.7	
	315H-Central Rio Grande Intermontane	3,865	2.3	
M313		34,439		1.14
	M313A-White Mountains-San Francisco Peaks-	21,050	61.1	
	M313B-Sacramento-Monzano Mountains	13,389	38.9	
321		79,901		2.65
	321A- Basin and Range	65,588	82.1	
	321B-Stockton Plateau	14,313	17.9	
322		93,370		3.10
	322A-Mojave Desert	51,958	55.6	
	322B-Sonoran Desert	36,125	38.7	
	322C-Colorado Desert	5,286	5.9	
331		304,718		10.12
	331A-Palouse Prairie	6,636	2.2	
	331B-Southern High Plains	25,136	8.2	
	331C-Central High Tablelands	27,080	8.9	
	331D-Northwestern Glaciated Plains	16,090	5.3	
	331E-Northeastern Glaciated Plains	27,031	8.9	
	331F-Western Great Plains	45,824	15.0	
	331G-Powder River Basin	23,674	7.8	
	331H-Central High Plains	16,938	5.6	
	331I-Arkansas Tablelands	19,423	6.4	
	331J-Northern Rio Grande Basin	5,340	1.8	
	331K-North Central Highlands	35,653	11.7	
	331L-Glaciated Northern Grasslands	12,732	4.2	
	331M-Missouri Plateau	36,047	11.8	
	331N-Belt Mountains	7,116	2.3	
332		141,665		4.71
	332A-Northeastern Glaciated Plains	25,154	17.8	
	332B-Western Glaciated Plains	13,713	9.7	
	332C-Nebraska Sand Hills	36,090	25.5	

	332D-North Central Great Plains	8,196	5.8	
	332E-South Central Great Plains	36,425	25.7	
	332F-South Central and Red Bed Plains	22,087	15.6	
M331		93,851		3.12
	M331A-Yellowstone Highlands	13,232	14.1	
	M331B-Bighorn Mountains	4,090	4.4	
	M331D-Overthrust Mountains	16,712	17.8	
	M331E-Uinta Mountains	6,040	6.4	
	M331F-Southern Parks and Rocky Mountain Range	9,038	9.6	
	M331G-South Central Highlands	11,929	12.7	
	M331H-North Central Highlands and Rocky	9,309	9.9	
	M331I-Northern Parks and Ranges	21,201	22.6	
	M331J-Wind River Mountains	2,301	2.5	
M332		76,256		2.53
	M332A-Idaho Batholith	17,987	23.6	
	M332B-Northern Rockies and Bitterroot Valley	8,421	11.0	
	M332D-Belt Mountains	13,687	18.0	
	M332E-Beaverhead Mountains	15,223	20.0	
	M332F-Challis Volcanics	5,543	7.3	
	M332G-Blue Mountains	15,396	20.2	
M333		37,518		1.25
	M333A-Okanogan Highland	11,869	31.6	
	M333B-Flathead Valley	8,449	22.5	
	M333C-Northern Rockies	7,576	20.2	
	M333D-Bitterroot Mountains	9,624	25.6	
M334		4,976		0.17
	M334A-Black Hills	4,976	100.0	
341		112,878		3.75
	341A-Bonneville Basin	28,063	24.9	
	341B-Northern Canyon Lands	19,875	17.6	
	341C-Uinta Basin	3,385	3.0	
	341D-Mono	6,521	5.8	
	341E-Northern Mono	19,587	17.4	
	341F-Southeastern Great Basin	26,766	23.7	
	341G-Northeastern Great Basin	8,682	7.7	
342		158,245		5.26
	342A-Bighorn Basin	8,639	5.5	
	342B-Northwestern Basin and Range	27,312	17.3	
	342C-Owyhee Uplands	14,898	9.4	
	342D-Snake River Basalts and Basins	19,966	12.6	
	342E-Bear Lake	3,296	2.1	
	342F-Central Basin and Hills	15,256	9.6	
	342G-Green River Basin	20,757	13.1	
	342H-Blue Mountain Foothills	14,092	8.9	
	342I-Columbia Basin	26,938	17.0	
	342J-Eastern Basin and Range	7,091	4.5	

M341		49,133		1.63
	M341A-East Great Basin and Mountains	21,332	43.4	
	M341B-Tavaputs Plateau	8,155	16.6	
	M341C-Utah High Plateau	9,273	18.9	
	M341D-West Great Basin and Mountains	10,373	21.1	
411		8,265		0.27
	411A-Everglades	8,265	100.0	

Appendix B. Glossary

This glossary of selected terms is associated primarily with climatic regimes, physiography, geologic formations, and vegetative physiognomy. Definitions were obtained from several sources. Climate, physiography, and geologic terms were obtained from the *Glossary of Geology* (Bates and Jackson 1980). Vegetative terminology came from two sources: Driscoll et al. (1984) and Grossman et al. (1998).

Climate

continental. The climate of the interior of a continent, characterized by seasonal temperature extremes and by the occurrence of maximum and minimum temperatures soon after summer and winter solstice, respectively.

marine. The climate of land masses bordering the ocean, characterized by the occurrence of maximum and minimum temperatures longer after the summer and winter solstices than in a continental climate.

subtropical. Said of the climate of the subtropics, which borders that of the tropics and is intermediate in character between tropical and temperate.

temperate. Said of a temperature that is moderate or mild. The term is also used to describe temperatures of the middle latitudes, whether moderate or not.

Physiography

alpine. Characteristic of the mountainous regions lying between timberline and snowline; said of the climate, flora, relief, ecology, etc.

badlands. Intricately stream-dissected topography, characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves.

barren(s). Rugged and unproductive land that is devoid of significant vegetation compared to adjacent areas because of environmental factors such as adverse climate or poor soil.

barrier island. A long, narrow coastal sandy island, representing a broadened barrier beach that is above high tide and parallel to the shore, and that usually has dunes and vegetated zones.

basin. A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

bottomland. Low-lying, level land that is usually highly fertile.

cirque. A deep, steep-walled, half-bowl-like recess or hollow, situated high on the side of a mountain and produced by the erosive activity of a mountain glacier.

desert. A region with a mean annual precipitation of 10 inches or less.

dissection. The process of erosion by which a relatively even topographic surface is gradually sculptured or destroyed by the formation of gullies, ravines, canyons, or other kinds of valleys.

drift. A general term applied to all rock material transported by a glacier and deposited directly by or from the ice, or by running water emanating from a glacier.

dune. A low mound or hill of loose, windblown granular material (generally sand) capable of movement from place to place but always retaining its characteristic shape.

estuary. The seaward end or the widened, funnel-shaped tidal mouth of a river valley where fresh water comes into contact with seawater and where tidal effects are evident.

floodplain. The surface or strip of relatively smooth land adjacent to a river channel and covered with water when the river overflows its banks.

foothill. A region of relatively low, rounded hills at the base of or fringing a mountain range.

highland. A general term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; a mountainous region.

hill. A natural elevation of the land surface having a well-defined (rounded) outline and less than 1,000 feet from base to summit; the distinction between a hill and a mountain is arbitrary and dependent on local usage.

interfluve. The area between rivers; especially the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction.

karst. A type of topography that is formed on limestone, gypsum, and other rocks by dissolution and that is characterized by sinkholes, caves, and underground drainage.

kettle. A steep-sided, bowl-shaped depression, commonly without surface drainage, in glacial-drift

deposits, often containing a lake or swamp.

lacustrine. Pertaining to or formed in a lake.

lobe. A rounded, tongue-like projection of glacial drift lying beyond the main mass of drift.

lowland. A general term for low-lying land or an extensive region of low land, especially near the coast and including the extended plains or country lying not far above tide level.

marsh. A water-saturated, poorly drained area, intermittently or permanently water covered, and having aquatic and grasslike vegetation, essentially without the formation of peat.

mesa. An isolated, nearly level landmass standing distinctly above the surrounding country, bounded by abrupt or steeply sloping erosion scarps on all sides and capped by layers of resistant, nearly horizontal rock.

morain. A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice.

mountain. Any part of the Earth's surface higher than a hill; sufficiently elevated above the surrounding land surface of which it forms a part to be considered worthy of a distinctive name.

outwash. Stratified detritus (chiefly sand and gravel) washed out from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier.

park. A term used in the Rocky Mountain region for a wide, grassy open valley lying at a high altitude and walled in by wooded mountains.

peneplain. A low, nearly featureless, gently undulating land surface of considerable area, which presumably has been produced by the processes of long-continued subaerial erosion. It may be characterized by gently graded and broadly convex interfluves sloping down to broad valley floors, and by truncation of strata of varying resistance and structure.

peninsula. An elongated body or stretch of land nearly surrounded by water and connected with a larger land area, usually by a neck or an isthmus.

piedmont. An area, plain, slope, glacier, or other feature at the base of a mountain.

playa. A term used in the Southwestern United States for a dry, vegetation-free, flat area at the lowest part of an undrained desert basin, underlain by stratified clay, silt, or sand, and commonly by soluble salts.

plain. An extensive region of comparatively smooth and level, or gently undulating, land having few or no prominent surface irregularities.

plateau. Any comparatively flat area of great extent and elevation, specifically, an extensive land region considerably elevated above the adjacent country. It is usually higher and has more noticeable relief than a plain.

pothole. A shallow depression, generally less than 10 acres in area, occurring between dunes on a prairie, often containing an intermittent pond or marsh and serving as a nesting place for waterfowl.

prairie. An extensive tract of level to rolling grassland, generally treeless, in the temperate latitudes of the interior of North America, characterized by a deep, fertile soil and by a covering of tall, coarse grass and herbaceous plants.

ridge. A general term for a long, narrow elevation of the Earth's surface, usually sharp crested with steep sides, occurring either independently or as part of a larger mountain or hill.

rolling (topography). Any land surface having a gradual succession of low, rounded hills or undulations that impart a wave effect to the surface.

savanna. An open, grassy, essentially treeless plain; usually there is a distinct wet and dry season, and what trees and shrubs are found are drought resistant.

sediment. Solid fragmental material that originates from weathering of rocks and is transported by air, water, or ice and that forms in layers in a loose, unconsolidated form.

sinkhole. A circular depression in a karst area. Its drainage is subterranean and it is commonly funnel shaped.

steppe. An extensive, treeless grassland area in the semiarid mid-latitudes of Southeastern Europe and Asia. It is generally considered drier than the prairie.

synclinal. A fold of which the core contains the stratigraphically younger rocks; it is generally concave upward.

tableland. A general term for a broad, elevated region with a nearly level or undulating surface of considerable extent.
terrace. Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.
terrain. A tract or region of the Earth's surface considered as a physical feature; an ecologic environment.
upland. A general term for an extensive region of high land, especially far from the coast or in the interior.
valley. Any low-lying land bordered by higher ground; especially an elongated, relatively large, gently sloping depression of the Earth's surface, commonly situated between two mountains.

Geologic

alluvium. A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during a comparatively recent geologic time by a stream or other body of running water.
amphibolite. A crystalline rock consisting mainly of amphibole and plagioclase with little or no quartz.
batholith. A large, generally discordant plutonic mass that has more than 40 mi^2 of surface exposure and no known floor. Its formation is believed to involve magmatic processes.
carbonate. A rock consisting chiefly of carbonate minerals such as limestone or dolomite.
cinder. A juvenile, vitric, vesicular, pyroclastic fragment that falls to the ground in an essentially solid condition.
coal. A readily combustible rock containing more than half by weight of carbonaceous material, formed from compaction and induration of plant remains similar to those in peat.
colluvium. Loose, heterogeneous soil material deposited by rainwash, sheetwash, or slow continuous downslope creep, usually collecting at the base of gentle slopes or hillsides.
dolomite. A carbonate sedimentary rock of which more than half by weight consists of the mineral dolomite or a variety of limestones or marble rich in magnesium carbonate.
felsic. A term applied to an igneous rock having abundant light-colored minerals in its mode.
gabbro. A group of dark-colored, basic intrusive igneous rocks.
gneiss. A foliated rock formed by regional metamorphism in which bands of granular minerals alternate with bands in which minerals having flaky composition predominate.
granite. A plutonic rock in which quartz constitutes 10 to 50 percent of the felsic components.
gypsum. A mineral consisting of hydrous calcium sulfate that is frequently associated with extensive beds of limestones, shales, and clay.
igneous. Said of a rock or mineral that solidified from molten or partly molten material.
indurated. Said of a rock or soil hardened or consolidated by pressure, cementation, or heat.
limestone. A sedimentary rock consisting chiefly of calcium carbonate.
loess. A widespread, homogeneous, commonly nonstratified, porous, friable, slightly coherent, usually highly calcareous, fine-grained blank deposit consisting predominantly of silt with subordinate grain sizes ranging from clay to fine sand. It is generally believed to be windblown dust of Pleistocene age, carried from desert surfaces, alluvial valleys, and outwash plains, or from unconsolidated glacial deposits uncovered by successive glacial recessions.
mafic. Said of an igneous rock composed chiefly of one or more ferromagnesian, dark-colored minerals that weather and produce soils of higher pH compared to nonmafic rocks.
marble. A metamorphic rock consisting predominantly of fine to coarse-grained recrystallized calcite and/or dolomite.
peat. An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of persistently high moisture content. It is considered an early stage in the development of coal.
pluton. An igneous intrusion of igneous rocks formed at great depth, which has become exposed on the Earth's surface through erosion.
pumice. A light-colored vesicular glassy rock usually of pyroclastic origin that is often sufficiently buoyant to float on water.
quartzite. A very hard but unmetamorphosed sandstone, consisting chiefly of quartz grains that have

been so completely and solidly cemented with secondary silica that the rock breaks across or through the grains rather than around them.

sandstone. A medium-grained, clastic sedimentary rock composed of abundant rounded or angular fragments of sand size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material.

saprolite. A soft, earthy, typically clay-rich, thoroughly decomposed rock, formed in place by chemical weathering of igneous, sedimentary, and metamorphic rocks.

shale. A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

siltstone. An indurated silt having the texture and composition of shale but lacking its fine lamination.

till. Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater and consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape.

volcanic. Pertaining to the activities or rock types of a volcano.

Vegetative

broadleaf. Woody vegetation primarily broadleaved that makes up more than 50 percent of the total woody cover.

cold deciduous. Unfavorable growing season characterized by below-freezing temperatures.

deciduous. Greater than 75 percent of the total woody cover sheds its foliage.

dwarf-shrubland. Shrubs less than 0.5 meters tall forming 26 percent or greater canopy cover.

evergreen. Greater than 75 percent of the total wood cover is never without green foliage.

forest. Trees more than 5 meters tall forming 61 to 100 percent canopy cover.

graminoid. Herbaceous vegetation composed of more than 50 percent graminoid or stipe leaf species.

grassland. Grasses dominant, forming at least 25 percent ground cover; trees or shrubs occupy 25 percent or less of the canopy cover.

mixed evergreen-deciduous. Evergreen and deciduous species generally contribute 25 to 75 percent of the total woody cover.

needleleaf. Woody vegetation primarily needleleaved that makes up more than 50 percent of the total woody cover.

shrubland. Shrubs 0.5 to 5 meters tall forming 26 percent or greater canopy cover.

sparse vegetation. Vegetation covers less than 25 percent of ground.

woodland. Trees more than 5 meters tall forming 26 to 60 percent canopy cover.

Appendix C. Description of Vegetation Cover Types

Presented here are brief descriptions of 35 naturally occurring vegetative cover types that were used to characterize prevailing vegetation of sections of the conterminous United States. Cover types may be visualized as the general, natural vegetation viewed from an aerial perspective. These cover types are used for descriptive purposes in the section narratives and should not be confused with potential natural vegetation (PNV), which was used in the process of identification and delineation of ecological units shown on the map. Some cover types are similar to PNV, particularly in forested regions. Other cover types, such as the prairie type, are present only in small areas that have been changed to agricultural type. For example, cover types may result from exclusion of some types of natural disturbance, such as fire, and include planned disturbances, such as harvesting. PNV for each section is presented in the tables that accompany the map.

The following description of cover types of the conterminous states is taken almost verbatim from Garrison et al. (1977), who subdivided the United States into 34 categories of major "soil-vegetation units," which they called ecosystems. Many of their ecosystems, some of which are based on Kuchler's (1964) classes of PNV, are repetitive, discontinuous units that do not fit the current classification framework that utilizes hierarchical ecosystems. For example, ponderosa pine occurs throughout the Western United States from the northern Cascade Mountains of Washington, east to the Black Hills of South Dakota, and south to New Mexico, across a range of latitude, elevation, climatic regimes, and soils where differing physical conditions combine to form equivalent environmental conditions suitable for the species. Although forest cover may be similar on portions of this large geographic area, use, management, and productivity of resources would likely differ, which attests to the value of ecological units based on multiple physical factors. To avoid confusion, we changed "ecosystems" of Garrison et al. (1977) to "cover types." Additional, more detailed information on other vegetation associated with these cover types, such as shrubs and herbs, is available in Barbour and Billings (2000).

Garrison et al. (1977) displayed their cover types on a 1:7,500,000 scale map, which is appropriate for national-level applications That map is out of print, but a U.S. Department of Agriculture (USDA) Forest Service map, "Current Cover Types, Version 2000," uses similar categories of vegetation and is available via the Internet. We used the Garrison et al. (1977) map to broadly characterize vegetation occurring in our section ecological units. Sections are large areas that are somewhat heterogeneous in environments and therefore usually contain several cover types. Greater homogeneity of environment and vegetation is attained at next lower level (i.e., subsections) in the national hierarchical framework of ecological units (Cleland et al. 1997).

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THE WHITE-RED-JACK PINE COVER TYPE

Physiography. The white-red-jack pine cover type occurs generally on smooth to irregular plains and tablelands of northern Lake States and parts of New York and New England. More than 50 percent of the area is gently sloping.

Climate. Precipitation averages 25–45 inches annually and is distributed rather evenly throughout the year. Normal pan evaporation is 30–35 inches. During the frost-free season of 120–140 days, precipitation is roughly equal to evaporation.

Vegetation. Forests in which 50 percent or more of the stand is eastern white pine, red pine, or jack pine, singly or in combination, represent the white-red-jack pine cover type. Common associates include oak, eastern hemlock, aspen, birch, northern white-cedar, and maple. Much of this cover type is included in Kuchler's Great Lakes pine forest community.

Fauna. The white-tailed deer and black bear are the most common larger mammals in this cover type, and the moose inhabits the extreme northern portion. The woodland caribou formerly was abundant. In times past, the eastern timber wolf was very numerous and fed on small animals and the larger mammals just mentioned, but it has become very scarce and is classified as an endangered species. The coyote, bobcat, great horned owl, and hawks are among current predators. The snowshoe rabbit and other small forest mammals are the main food source of the predators already mentioned. Spruce grouse and ruffed grouse inhabit the cover type. Porcupines inhabit parts of the cover type and become a problem in forest management when they are overly abundant.

Breeding bird populations average about 153 pairs per 100 acres. The black-burnian and the black-throated green warbler are the most abundant. Other birds include the whippoorwill, crested flycatcher, wood pewee, white-breasted nuthatch, veery, tanagers, ruffed grouse, great horned owl, pileated woodpecker, hairy woodpecker, downy woodpecker, blue jay, chickadees, red-eyed vireo, black-and-white warbler, ovenbird, redstart, black-throated blue warbler, hermit thrush, magnolia warbler, Canada warbler, yellow-bellied sapsucker, olivesided flycatcher, red-breasted nuthatch, brown creeper, winter wren, blue-headed vireo, myrtle warbler, slate-colored junco, and white-throated sparrow. The endangered Kirtland's warbler occurs in limited areas.

Soils. The cool, moist soils are predominantly Spodosols. They have a low supply of bases and a horizon in which organic matter and compounds of iron and aluminum have accumulated, but they have no dense, brittle, or indurated horizon (Haplorthods). Soils of a significant proportion of the cover type are moist throughout the year and coarse textured, and they lack pedogenic horizons (Udipsamments).

Land use. Nearly all of the land is forested and is used principally for lumbering and recreation. The associated cropland is devoted largely to growing potatoes and forage for dairy cattle. Large urban areas characterize the northeastern portions.

THE SPRUCE-FIR COVER TYPE

Physiography. The spruce-fir cover type occurs on flat plains and tableland in the Lake and New England States and at high elevations in the Appalachian Mountains. At high elevations it occurs as far

south as West Virginia. Except for some especially high places, local relief is almost entirely less than 500 feet and often less than 100 feet. More than half of the area is gently sloping.

Climate. Normal annual precipitation is 30–40 inches, half of which falls during the frost-free season of 120–140 days. Normal annual evaporation is 30–40 inches. Evaporation is about equal to precipitation during the frost-free season.

Vegetation. Forests in which 50 percent or more of the stand is spruce or true fir, singly or in combination, characterize this cover type. Common associates include northern white cedar, tamarack, maple, birch, eastern hemlock, and eastern white pine.

Fauna. The fauna of the spruce-fir cover type is similar to that described for other northern conifer regions. A list of mammals at Mount Katahdin, ME, includes moose, woodland caribou, lynx, marten, black bear, long-tailed weasel, white-footed mouse, and other mice and shrews. The moose, black bear, and white-tailed deer are the most common larger animals in the conifer areas.

The ruffed grouse is common throughout this cover type. The wild turkey may be found toward the south; the spruce grouse is found more to the north. The eastern timber wolf is considered an endangered species. Characteristic breeding birds of the cover type in the Northeastern States are the olive-backed thrush, magnolia warbler, Cape May warbler, myrtle warbler, bay-breasted warbler, and white-throated sparrow. The density of territorial males may be as high as 430 per 100 acres.

Soils. The cool, moist soils of this cover type are predominantly Spodosols, although a large acreage of Histosols occurs in the Lake States. The Spodosols have a low supply of bases and a horizon in which organic matter and iron and aluminum compounds have accumulated. No dense, brittle, or indurated horizon is present (Haplorthods). The Histosols are wet, organic (peat and muck) soils.

Land use. In the Northeastern States, much of the area is forested. Lumbering and recreation are major uses of the forest. About 10 percent of the area is in crops or pastures. Most of the cropland is in forage crops for dairy cattle. In many cases farming is a part-time enterprise.

THE LONGLEAF-SLASH PINE COVER TYPE

Physiography. The longleaf-slash pine cover type is restricted to flat and irregular southern Gulf Coastal Plains. More than 50 percent of the area is gently sloping. Local relief is less than 300 feet. The southern Gulf Coastal Plains are a grouping of various plains of materials ranging from sandy or gravelly to moderately fine textured; these materials developed from the underlying materials of unconsolidated sands, silts, and clays. This cover type is often referred to as the “southern pine hills,” the “piney-woods,” or “pine-wiregrass type.”

Climate. The longleaf-slash pine cover type occurs in a moist, warm climate where the average annual precipitation is 40–60 inches. The average annual evaporation is 42–48 inches. The average precipitation in the east is lowest in autumn and highest in midsummer and in the west is lowest in winter and spring. Summer droughts are common in spite of the high amount of precipitation and relatively low evaporation. The mean annual temperature is 64 °F, and the average frost-free period is 200–280 days, increasing from north to south.

Vegetation. Forests in which 50 percent or more of the stand is longleaf pine or slash pine, singly or in combination, characterize this cover type. Common associates include other southern pines, oak, and sweet gum.

On most sites, grasses either dominate the understory or share dominance with shrubby vegetation. East of the Apalachicola River, wiregrasses are the main herbaceous plants; in the western section, bluestems provide most of the herbage. Other important grasses include panicums, paspalums, and dropseeds. Gallberry, saw-palmetto, waxmyrtle, and shining sumac are prominent among the shrubs.

Fauna. Longleaf-slash pine forests provide habitats for a wide variety of animal life. Except for a few isolated areas where the black bear or the endangered Florida panther may be encountered rarely, the white-tailed deer is the only large, indigenous mammal. Common small mammals include the raccoon, the opossum, tree squirrels, rabbits, and numerous species of ground-dwelling rodents. The bobwhite and the wild turkey are the principal gallinaceous game birds. Resident and migratory nongame bird species are numerous, as are species of migratory waterfowl. The red-cockaded woodpecker is an endangered species. There are reptiles of many species, the endangered American alligator being the largest of the reptiles.

Soils. Longleaf-slash pine vegetation grows on a wide variety of upland soils, but most of the soils are acid in reaction, low in content of organic matter, and deficient in the major plant nutrients. The soils are derived mainly from Coastal Plain sediments, ranging from heavy clay to gravel, but with sandy materials predominating. Silty soils occur mainly on expansive level areas. Although sands are most prevalent in hilly sections, they occur on broad flats in central Florida. Sandy soils having a dense, though not impermeable, subsoil are apparently most favorable for longleaf pine.

The soils are mainly of three orders: (1) those low in content of bases and having subsurface horizons of accumulated clay—they are usually moist, but during the warm season some are dry part of the time (Ultisols); (2) those with a low supply of bases and having in subsurface horizons an accumulation of amorphous materials consisting of organic matter and compounds of aluminum and, usually, iron—these

soils formed in acid, mainly coarse-textured materials (Spodosols); and (3) those having no pedogenic horizons (Entisols). Hapludults, Haplaquods, and Quartzipsamments comprise the principal great soil groups.

Land use. Portions of the cover type are largely in farms; other portions are largely owned by pulp and paper mills. In general, half to nearly the entire cover type is forested, and the trend is to more forest and improved pasture and less cropland. In southern Florida, only about one-fourth of the cover type is in forest, which is grazed, and about one-half is in improved pasture.

THE LOBLOLLY-SHORTLEAF PINE COVER TYPE

Physiography. The loblolly-shortleaf pine cover type generally occurs on irregular Gulf Coastal Plains and the Piedmont where 50–80 percent of the area is gently sloping. Local relief is 100–600 feet on the Gulf Coastal Plains and 300–1,000 feet on the Piedmont. About 20 percent of the cover type occurs on the flat Coastal Plains where more than 80 percent of the area is gently sloping and local relief is less than 100 feet. This is the largest cover type in the South and Southeast.

Climate. The climate is rather uniform throughout this cover type. Precipitation averages 40–60 inches annually. It is rather evenly distributed through the year but peaks slightly in midsummer or early spring in the western areas. Precipitation exceeds evaporation, but summer droughts occur. The average annual temperature is 60–68 °F. The frost-free period averages 200–280 days, and 200–250 days in the Piedmont.

Vegetation. This cover type is characterized by forests in which 50 percent or more of the stand is loblolly pine, shortleaf pine, or other southern yellow pines, singly or in combination. Common associates include oak, hickory, sweetgum, blackgum, red maple, and winged elm. The main grasses are bluestems, panicums, and longleaf uniola. Dogwood, viburnum, haw, blueberry, American beautyberry, yaupon, and numerous woody vines are common.

Fauna. The fauna varies with the age and stocking of the timber stand, the percentage of deciduous trees, and the proximity to openings, bottom-land forest types, etc. The white-tailed deer is widespread, as is the cottontail. When deciduous trees are present, the fox squirrel is common on uplands. Gray squirrels are found along intersecting drainages. Raccoon and fox are found throughout the cover type and are hunted in many areas.

The eastern wild turkey, bobwhite, and mourning dove are widespread. In mature forests, the density of breeding birds is about 240 pairs per 100 acres. Of the 20 odd species present, the most common include the pine warbler, cardinal, summer tanager, Carolina wren, rubythroated hummingbird, blue jay, hooded warbler, eastern towhee, and tufted titmouse. The red-cockaded woodpecker is an endangered species.

Soils. Typical soils are low in content of bases and have subsurface horizons of accumulated clay. The clay horizons may be relatively thin (Hapludults) or thick (Paleudults). They are usually moist, but during the warmest months some are dry part of the time. Near the coast the soils are seasonally wet and have mottles or concentrations of iron and manganese or are gray (Aquults). The Gulf Coastal Plains are underlain by unconsolidated sands, silts, and clays, while the Piedmont is a dissected plateau underlain by schists, gneisses, granites, sandstones, and shales.

Land use. About 60–70 percent of the cover type is in forest, mostly in farm woodland, but a few large areas are in national forests or are managed by large lumber companies. About 20 percent of the area is in cropland, and cash crops are produced. The trend recently has been toward using more of the area for pasture and woodland and less for crops.

THE OAK-PINE COVER TYPE

Physiography. The oak-pine cover type occurs on diverse land forms from the southernmost ridges and valleys of the Appalachians westward across the Coastal Plains and north into the Ozark Plateaus and Ouachita provinces. Typically it occupies on irregular plateaus where 50–80 percent of the area is gently sloping and local relief is 100–300 feet. Almost as commonly it occupies hills and mountains where gentle slopes may cover as little as 20 percent of the area and local relief may reach 1,000–3,000 feet.

Climate. The climate is quite uniform throughout the oak-pine cover type. Precipitation is relatively high, averaging 40–54 inches annually, and most of it comes in late autumn and spring. Summers are dry. The average annual temperature varies from 55–68 °F, and the average freeze-free period is 180–220 days.

Vegetation. This cover type is characterized by forests in which 50 percent or more of the stand is hardwoods, usually upland oaks, but in which southern pines, mainly shortleaf pine, make up 25–49 percent of the stand. Common associates include sweetgum, hickory, and yellow-poplar.

Fauna. The fauna is similar to that of the adjacent oak-hickory cover type. Animals include the white-tailed deer, fox squirrel, and cottontail, and birds include the mourning dove, bobwhite, and turkey. Many small mammals are present, and the avian fauna is quite varied.

Soils. Typical soils are low in supply of bases and have a subsurface horizon of accumulated clay that

ranges from relatively thin (Hapludents) to thick (Paleudults). They are usually moist but may become dry during part of the dry season. The soils of the Ozarks are developed from cherty limestones, while those of the southern Appalachians are developed from noncherty limestones.

Land use. Most of this cover type is in farms. About 60 percent is in forest, mostly in small holdings. Twenty percent is cropland. This is a cash-crop area. Less than 10 percent is in pasture. Much of the livestock produced is consumed on the home farm.

THE OAK-HICKORY COVER TYPE

Physiography. The oak-hickory cover type occurs in areas of the Eastern United States that are more mesophytic than surrounding areas. It reaches from southern Maine to Lake Huron and to southern Texas. Its most continuous area is known as the Ozark Plateaus with extensions (Cross Timbers) into the semiarid grasslands of the southern Great Plains and the interior low plateaus that fuse with the glacial till plains south of the Great Lakes and extend westward around the Ozark Plateaus (immediately west of the central Appalachian Highlands). This cover type also occurs on the uppermost limits of the Appalachian Highlands, known as the Blue Ridge and the Valley and Ridge provinces of these highlands. These areas are geologically the oldest uplifts in the United States.

The Ozark Plateaus and their extensions comprise an area of 72,000 square miles west of the Mississippi River and south of the Missouri River. They consist of plateaus, variously dissected, and of strong rock. Much of the area is steep and lies at altitudes of 1,000–2,000 feet. Narrow belts of physiographically similar areas extend as far south as Texas and New Orleans and, along streams, north into Iowa. The interior low plateaus and their extensions lie east and north and extend westward around the Ozark Plateaus. These plateaus are similar to the Appalachian provinces in that the rocks and soils are highly weathered. The extensions are more characteristically glacial till plains.

The Blue Ridge and the Valley and Ridge provinces are Appalachian Mountain belts west of the Piedmont. The mountains are remnants of a former highland. Most of the rocks are old, strong, and of highly complex structure. These provinces are characterized by “folded” mountains in which resistant strata form ridges and weaker rocks are worn down to lowlands.

The oak-hickory cover type also includes the Black Belt, which is the richest and best known lowland on the East Gulf Coastal Plain. It is so named because of the deep, black residual soil. The belt varies from 20–25 miles wide from near the Georgia border, west through Alabama, and north through Mississippi. Its altitude varies from 200–400 feet. Rivers cut through the belt; there are few smaller streams.

Climate. Temperatures vary considerably in this cover type. The frost-free season is about 120 days in the northern portion and almost 300 days in southern Texas. In most of the area, the frost-free season ranges from 160–200 days. Annual precipitation ranges from less than 30 to more than 50 inches, averaging 35–45 inches. More than half of the precipitation falls in the warmest months. In many areas, potential evaporation during the warmest months is about equal to the precipitation.

Vegetation. The oak-hickory cover type varies from open to closed woods with a strong to weak understory of shrubs, vines, and herbaceous plants. By definition, oak and hickory must make up 50 percent of the stand, singly or in combination. The cover type includes six vegetation communities: the Black Belt on the Coastal Plain in Alabama and Mississippi, the oak-hickory forest and the mosaic of the oak-hickory forest and bluestem prairie communities of the Ozark Plateaus and interior low plateaus and their extensions, the oak forest of the Appalachians, the oak savanna, and Cross Timbers.

Sweetgum and red cedar are close associates in the southern (Black Belt) region of the cover type. Maple, elm, yellow-poplar, and black walnut often are close associates in eastern and northern parts of the oak forest and the oak-hickory-bluestem mosaic. The major shrubs are blueberry, viburnum, dogwood, rhododendron, and sumac. The major vines are woodbine, grape, poison ivy, greenbrier, and blackberry. Important herbaceous plants are sedge, panicum, bluestem, lespedeza, tick clover, goldenrod, pussytoes, and aster; many more are abundant locally.

Fauna. The fauna of the oak-hickory cover type is similar to that of other eastern hardwood and hardwood-conifer areas and varies somewhat from north to south. Important animals in the cover type include the white-tailed deer, black bear, bobcat, gray fox, raccoon, gray squirrel, fox squirrel, eastern chipmunk, white-footed mouse, pine vole, short-tailed shrew, and cotton mouse.

Bird populations are large. The turkey, ruffed grouse, bobwhite, and mourning dove are game birds in various parts of the cover type. Breeding bird populations average about 225 pairs per 100 acres and include some 24 or 25 species. The most abundant breeding birds include the cardinal, tufted titmouse, wood thrush, summer tanager, red-eyed vireo, blue-gray gnatcatcher, hooded warbler, and Carolina wren. The box turtle, common garter snake, and timber rattlesnake are characteristic reptiles.

Soils. The soils of this cover type are varied. The northeastern oak-hickory forest and the northeastern portion of the Appalachian oak forest are on Inceptisols and Ultisols. Soils of the smaller Black Belt area are largely Ultisols. The soils of the largest community in the cover type, the oak-hickory forest, are mainly Mollisols and Alfisols in the north and Ultisols in the central portion. Two “fingers” of the oak-hickory forest reaching into southern Texas coincide with areas of Alfisols; Vertisols on all sides are in other cover types.

Land use. Small general farms characterize much of the area, but there are also large dairy and livestock farms. Tobacco is an important cash crop in the east and cotton is important in the west. The steeper slopes, accounting for almost half the area, are mainly in forest, which is used for both recreation and timber production. A large part of the Nation's coal is mined in this cover type.

THE OAK-GUM-CYPRESS COVER TYPE

Physiography. The oak-gum-cypress cover type is characterized by the vegetation of the Mississippi Valley and other bottom lands in every Southern State, the cypress savanna west of the Everglades in Florida, the mangrove swamps south of the Everglades, and the east coast of Florida, Georgia, and the Carolinas. Many of the rivers that cross the Coastal Plain province have little drop in elevation—the Mississippi River drops only 7.5 inches per mile from Memphis to Vicksburg—and are meandering. The rivers have created large alluvial plains. The largest plains are along the Mississippi River and extend from the Gulf of Mexico to the Ozark-Ouachita Highlands and north eastward to Indiana. Other river flood plains are much smaller but in aggregate constitute several million acres.

The alternating drylands and wetlands west of the Everglades are known as the cypress savanna, which is a monotonous flatland, very few feet above sea level. Outcrops of dense, fine-grained limestones are scattered through the area, but these do not affect the flatness of the plain. The mangrove swamps of southern Florida are an extension of the Everglades into the ocean. Salt water invades that part of the coastline, making it different from the Everglades and the cypress savanna.

Climate. Most of this cover type has a moist, mild climate, the frost-free season ranging from 200 days to practically all year at the tip of Florida. Precipitation ranges from 60 inches in Florida to about 35 inches at the northern extremity of the cover type in Indiana. More than half the precipitation comes in the warmest months, and in most of the area rainfall exceeds evaporation during the frost-free season.

Vegetation. The vegetation of this cover type varies considerably, but the dominants are of tree life form. It is made up of bottom-land forests in which 50 percent or more of the stand is tupelo, blackgum, sweetgum, oak, and bald cypress, singly or in combination—except where pines comprise 25–49 percent of the stand (in which case the cover type is oak-pine). Common associates include willow, maple, sycamore, cottonwood, and beech. Most species are broadleaved deciduous trees. Trees of the mangrove swamp are mainly black mangrove and red mangrove. The vegetation of the cypress savanna is dominated by needleleaved deciduous frees and some broadleaved evergreen or deciduous trees and shrubs. The trees and shrubs occur in groves surrounded by open grassland dominated mainly by three-awn species. Mangrove swamps are often flooded by tidewater; the cypress savanna is flooded less frequently and only by fresh water.

Fauna. This cover type is the most fertile and productive of southern habitats for wildlife. In times past, large animals, such as the deer, elk, black bear, mountain lion, bobcat, and wolf, inhabited the forest. Presently, the white-tailed deer is common in most areas. Other mammals include the gray fox, gray squirrel, fox squirrel, raccoon, opossum, striped skunk, eastern cottontail, swamp rabbit, and many small rodents and shrews.

Birds include wild turkeys and, in the flooded areas, ibises, cormorants, herons, egrets, and kingfishers. Among the numerous species of birds in the area, the ivory-billed woodpecker, Bachman's warbler, and the southern bald eagle are classed as endangered species. The Carolina parakeet is extinct. Many species in the mangrove swamps and the cypress savanna are the same as those in the Everglades, in the wet grasslands cover type. Common mammals in the mangrove area are the fox squirrel and raccoon. Nesting birds include the mangrove cuckoo and various herons and egrets. The key deer is very scarce and is classed as an endangered species.

Soils. Soils of this cover type are varied. In the largest area, the Mississippi bottom land, they are Mollisols, Alfisols, and, primarily, Inceptisols. The soils of the small area in southern Florida are primarily Inceptisols. In the many bottom lands extending inland from the Atlantic coast, the soils are mainly Ultisols, smaller areas of Inceptisols being near the coast.

Land use. Nearly all of the area is in farms. The wettest parts that are not artificially drained, about 10 percent of the area, remain in forests. The remainder is evenly divided between cropland and pasture. Cotton, soybeans, and corn are major crops in most of the region; rice and sugarcane are important locally.

THE ELM-ASH-COTTONWOOD COVER TYPE

Physiography. The elm-ash-cottonwood cover type occurs in narrow belts along major streams or scattered areas of dry swamps. The major portion is on the lower terraces and flood plains of the Mississippi, Missouri, Platte, Kansas, and Ohio Rivers from the Dakotas, Minnesota, and Ohio south through Kansas and Missouri. The cover type also is scattered throughout the area including States adjacent to the Great Lakes and extending to the east coast, where it occurs on dissected glacial-till plains.

Climate. The cover type crosses several climatic zones. It is characteristic of sites that are moist as a result of either flooding or precipitation. Average annual precipitation varies from 10 inches near the foothills of the Rocky Mountains to 50 inches in the southern and northeastern areas. Temperatures vary

considerably, the January mean daily low ranging from zero in the north to 30 °F in the south. The average frost-free period varies from 100 days in the north to 200 days in the south.

Vegetation. The vegetation of this cover type is a tree life form of low to tall broadleaved deciduous trees, varying from open to dense and often accompanied by vines. Cottonwood species usually dominate the cover type and often occur in pure stands. Cottonwood is most common along the streams. Swamp cottonwood is more common in other places. Common associates in the north are willow species and green and white ash. Sycamore and sugarberry are common associates in the south. Other common associates are willow, sycamore, beech, and maple. The cottonwood-willow stage is short lived. This stage is followed by the river birch and silver maple-American elm types in the north and by the sycamore-pecan-American elm or sugarberry-American elm-green ash types in the south.

Fauna. Since this cover type is far flung and is in the main flood plains of rivers dissecting a number of other, quite different cover types, the fauna is varied and, in many cases, influent from the surrounding cover types. Forest-edge animals and birds are common, and numerous ones include the cottontail, bobwhite, white-tailed deer, raccoon, red fox, coyote, striped skunk, spotted skunk, meadow jumping mouse, fox squirrel, and ground squirrels. The sharp-tailed grouse inhabits grassy areas and open areas in the forest. The ruffed grouse is also present. Other birds include the catbird, goldfinch, yellow-billed cuckoo, indigo bunting, cardinal, lark sparrow, mockingbird, common crow, blue jay, robin, ruby-throated hummingbird, and Cooper's hawk.

Soils. The soils are mainly MoIlisols (Haplaquolls plus Udifluvents, Hapludolls, and Hapludalfs) that are seasonally wet and have a thick, nearly black surface horizon and gray subsurface horizons. The materials in the horizons have been altered or removed, but no clay or calcium carbonate has accumulated.

Land use. At least 30 percent of this cover type is in forest, mainly as small woodlots on wet bottom land and steep slopes bordering stream valleys. The rest is cropland devoted primarily to corn, soybeans, oats, and other feed grains. Much of the grain is fed to beef cattle and hogs on the farms where it is grown.

THE MAPLE-BEECH-BIRCH COVER TYPE

Physiography. The maple-beech-birch cover type is best developed in the New England States. Typically, it occurs on open high hills and low mountains. Only about 20–30 percent of the area is gently sloping. Ridges rise 500–3,000 feet above the broad valleys. Farther west, in the Lake States, the cover type occurs on irregular plains and tablelands. There, 50–80 percent of the area is gently sloping and local relief is normally 100–300 feet.

Climate. Mean annual precipitation ranges from 40–48 inches and is about 41 inches at central locations. The average annual snowfall of 72 inches covers the ground for about 87 days each year. The number of freeze-free days ranges from 120–150 per year. The mean daily maximum temperature is 24–36 °F in January and 74–80 °F in July. The corresponding minimum temperatures are 4–18 °F and 52–60 °F. Potential evapotranspiration is 17–28 inches. The mean annual water surplus is 10–34 inches.

Vegetation. A forest is classified as being in this cover type when 50 percent or more of the stand is maple, beech, or yellow birch, singly or in combination. Common associates include hemlock, elm, basswood, and white pine.

Fauna. The white-tailed deer occurs throughout much of the maple-beech-birch cover type. The hardwood forest and the openings and farms within it provide food and cover for a varied fauna. The black bear is present in many areas. The wolf is no longer common, but the red fox and gray fox are rather widespread, as is the bobcat. Several species of squirrels are in the forest, and a number of smaller rodents inhabit the forest floor.

The ruffed grouse is widespread, and the bobwhite inhabits the interspersed farmlands and forest openings. Songbirds include the ovenbird, red-eyed vireo, hermit thrush, scarlet tanager, blue jay, black-capped chickadee, wood pewee, and magnolia warbler.

Soils. Typical soils have a low supply of bases and a subsurface horizon that is dense and brittle but not indurated or that contains an accumulation of organic matter and iron and aluminum compounds (Fragiorthods and Haplorthods). Other major soils have light-colored surface horizons and a subsurface horizon that is dense and brittle but not indurated (Fragiochrepts).

Land use. Much of the area is in farms. Feed grains and forage for dairy cattle are the principal crops. Potatoes are important locally. The steeper land is mainly forested, produces significant amounts of timber, and is an important recreation resource.

THE ASPEN-BIRCH COVER TYPE

Physiography. The aspen-birch cover type lies mainly within the Great Lakes section of the Central Lowland east of the Mississippi River and extends from western Minnesota to Lake Erie. This area is characterized by a great variety of features of recent glacial origin. In addition to moraines and outwash plains, thousands of lakes and large areas of swamps are in the area. The underlying rock strata of the area are buried by thousands of feet of glacial till. These strata span the ages from Cambrian to

Carboniferous. Three strong formations of dolomite, limestones, and sandstones form outcrops on the edges of two cuestas. The intervening weak beds do not form any particular features. Elevations vary from 600–1,500 feet.

Climate. The areas occupied by this cover type have a moist and cool climate. The frost-free period varies from 100–140 days. Average annual temperatures are 35–47 °F. Annual precipitation is 30–35 inches, of which 40–66 percent falls during the warmest months. Precipitation during the frost-free season ranges from about 80 percent of the evaporation potential to about equal that potential.

Vegetation. This cover type is characterized by forest in which 50 percent or more of the stand is aspen, balsam poplar, paper birch, or gray birch, singly or in combination. Common associates include maple and balsam fir. Major aspen species in the Great Lakes area are bigtooth and quaking aspen. Paper birch is a common associate. Balsam poplar is important only along streams and the margins of swamps.

Fauna. The fauna of the aspen-birch cover type is similar to those of the spruce-fir and white-red-jack pine cover types, with which this cover type is intermingled. The white-tailed deer and black bear are common. The coyote, bobcat, great horned owl, and other predators feed on a variety of small mammals. The ruffed grouse is present. Among the songbirds are the tufted titmouse, blue jay, hairy woodpecker, downy woodpecker, wood thrush, eastern wood pewee, goldfinch, catbird, and red-eyed vireo.

Soils. The aspen-birch cover type occurs on a wide variety of soils, but they are mainly within three orders. The better drained soils are mostly Alfisols, and the wetter, poorly drained soils are Entisols and Mollisols.

Land use. More than 80 percent of the area is in forest. Lumbering, recreation, and mining are major industries. Feed grains and forage for dairy cattle and other livestock are the main products of cropland. Potato growing is important locally.

THE DOUGLAS-FIR COVER TYPE

Physiography. The Douglas-fir cover type encompasses one of the larger blocks of western timber in that it includes much of the mountains in western Oregon and western Washington and extends well south into the northern California Coast Ranges. It is an extensive cover type, for there are large acreages of it in the northern Rocky Mountains and lesser scattered areas in the Blue Mountains of Oregon and the middle and southern Rocky Mountains. The elevational range is great, from 500 feet up into the high mountains.

Climate. The length of the frost-free season is 200 days in western coastal areas and 160 days in the rest of western Oregon and Washington. In the rest of the cover type, the frost-free season is about 80–120 days. Average annual precipitation is 40–80 inches in the extreme west and 20–30 inches in most of the interior portion of the cover type. In the extreme west, 50–60 percent of the total precipitation occurs during the period December to March. In the rest of the cover type, only 25–40 percent of the precipitation occurs in the coldest months. The amount of precipitation during the frost-free season is equal to, or not less than, 40 percent of the evaporation in western Oregon and western Washington. In the rest of this cover type, precipitation during the frost-free season is only 30–40 percent of the evaporation potential.

Vegetation. This cover type is characterized by forest consisting of 50 percent or more Douglas fir, except where redwood, sugar pine, or western white pine comprise 20 percent or more of the stand. Most common ecological descriptions of one of the largest blocks of timber in western Oregon and Washington define it as subclimax stands in areas where the climax is western hemlock-western red cedar. Common shrubs in the cover type are of the genera of maple, rock spirea, filbert, blueberry, snowberry, barberry, currant, blackberry, ninebark, rose, and spirea. Herbage includes grass and other vegetation having a grasslike growth form, especially in the stands in interior States. Here, pinegrass and *Carex concinnoides* are present.

Fauna. Common large mammals in this cover type include elk, deer, and black bear. Grizzly bear and moose are in the northern Rockies. Blue and ruffed grouse are present. Most of the northwestern part of the cover type has hawks and owls. Mammalian predators include mountain lions and bobcats. Small mammals include mice, squirrels, marten, chipmunks, and bushy-tailed wood rats. Some of the more common birds are the chestnut-backed chickadee, red-breasted nuthatch, gray jay, and Steller's jay.

Soils. In western Washington and Oregon the soils of this cover type are Inceptisols and Ultisols. In the northern coastal area of California they are Ultisols. In the Blue Mountains of Oregon, the soils are Mollisols with an overburden of very absorptive Vitrandepts. In the northern Rockies the soils are Inceptisols (including considerable areas of Vitrandepts), Alfisols, and Mollisols. In the middle and southern Rocky Mountains, the soils are Mollisols, Entisols, and Alfisols.

Land use. About 75 percent of the land area is forested, and lumbering is a major industry. Less than 20 percent is in crops or improved pasture. Fruit, vegetables, and grain are the major crops. Forage and feed grains occupy large acreages.

THE PONDEROSA PINE COVER TYPE

Physiography. Because ponderosa pine has a rather wide range of adaptability and can dominate some of the less mesic true forest sites, it occupies low mountains and foothills in many places; yet in mixtures

with other species, it is found at moderate elevations. The extensive distribution of ponderosa pine and associates includes parts of 14 Western States from Nebraska to the Pacific coast and from Arizona to Canada. It is the largest western forest type in the United States. Local topography can be gentle, as on plateau tops and low mountains, or it can be steep, as on canyon walls and faces. Semiarid, low mountain sites are common, but it is difficult to characterize the physiography of the cover type because it varies greatly.

Climate. The length of the frost-free season at any location in the cover type depends largely upon the latitude and elevation. In general, in much of the northern area the frost-free period is 120 days, whereas in many foothill areas and in parts of the Sierra and the Gila Mountains of the Southwest, it can be 240 days.

Annual precipitation is about 15–20 inches in the more pure pine areas, but where there are combinations of pine and other conifers at moderate elevations, the precipitation can total 30 inches. In the far western sector, only 25 percent of this moisture falls in the warmest months. In the northern Rocky Mountains, 40–50 percent of the precipitation occurs in the warmest months. In the middle to southern Rockies, 66–75 percent occurs in the warmest months. In the southern areas and those at low elevations, precipitation during the frost-free season is only 20 percent of the evaporation potential. In northern areas precipitation during the growing season may be as high as 40 percent of the evaporation potential.

Vegetation. By definition, ponderosa pine forest is 50 percent or more of one of these pines: ponderosa pine, Jeffrey pine, sugar pine, limber pine, Arizona ponderosa pine, Apache pine, or Chihuahua pine. The exceptions are those situations where western white pine or sugar pine comprises 20 percent or more of the stand; then these species control the name of the forest.

The impact of logging and ecological dynamics can cause some problems in maintaining good delineation of the ponderosa pine cover type. This cover type is idealized as open and parklike with an excellent ground cover of grasses, sedges, and forbs or with an understory of shrubs of low to medium height. The shrubs, however, may vary from antelope bitterbrush in Oregon to bearmat in the Sierra Nevada in California. In perhaps 60 percent of the area, the idealized open character of the ponderosa pine cover type has changed to that of a dense and growth-retarded stand, particularly in the Pacific Northwest.

Fauna. In the ponderosa pine cover type, the major mammalian influents are the Rocky Mountain elk, mule deer, mountain lion, and coyote. Animals of less importance include the bushy-tailed wood rat, white-footed mouse, bobcat, rock squirrel, cottontail, porcupine, mantled ground squirrel, Kaibab squirrel, and chipmunks. The Kaibab squirrel is rare. It is endemic to this cover type on Arizona's Kaibab Plateau.

The most abundant and important resident birds in the ponderosa pine cover type include the pygmy nuthatch, long-crested jay, sharpshinned hawk, Rocky Mountain nuthatch, mountain chickadee, Cassin's purple finch, redshafted flicker, red-backed junco, western goshawk, and western red-tailed hawk. Birds that are common during the summer include the chestnut-backed bluebird, Audubon's warbler, Natalie's sapsucker, western chipping sparrow, horned owl, and band-tailed pigeon.

Soils. The soils occupied by the ponderosa pine cover type vary tremendously. Along the western edge of the Columbia Plateau and the east slope of the Cascade Mountains, they are Mollisols, Inceptisols, Entisols, and Aridisols. In northern and eastern California, ponderosa pine stands are associated with Ultisols. At the northern edge of the Columbia Plateau (Okanogan Highlands) and in much of the northern Rocky Mountains, pine and the related forest types occur on Inceptisols; the soils of the rest of these areas are largely Alfisols and Entisols. In the Blue and Wallowa Mountains of eastern Oregon, pine stands occupy Mollisols. In the middle and southern Rocky Mountains, pines and associates are on Mollisols, Aridisols, Entisols, and Alfisols. Pine stands in the Gila Mountains are largely on Mollisols. The small stands of pine in the Great Basin are on Aridisols.

Land use. Ponderosa pine lands continue to be producers of softwood that is highly desired for either millwork or framing. The forage supply within the cover type has been highly prized for summer range, because the land is usually high enough to get good precipitation and the forest soils are deep enough to store sufficient water for growing timber and good ground cover. These precipitation and soil characteristics make the cover type productive of forage during the hot months when range forage at lower elevations has dried.

THE WESTERN WHITE PINE COVER TYPE

Physiography. The western white pine cover type mainly occurs in the high mountains of the northern Rocky Mountains of western Montana and northern Idaho. It is also in scattered small areas in the Cascade Mountains of Oregon and Washington. Less than 20 percent of the total area is gently sloping, and local relief is more than 3,000 feet. Elevations are mostly 4,000–8,000 feet.

Climate. Annual precipitation in this cover type is 20–30 inches; of this, 60–65 percent occurs during the warmest months. During the frost-free season, precipitation is 20–40 percent of the evaporation potential. The length of the frost-free period is 80–120 days.

Vegetation. Forests in which 20 percent or more of the stand is western white pine or sugar pine characterize this cover type. Kuchler's classification of cedar-hemlock-pine forest corresponds with this cover type. Daubenmire and Daubenmire (1968) would classify western white pine as being in various

western red cedar habitats, but also as being seral to some western hemlock and true fir habitats. In summary, western white pine is sometimes found in pure stands yet commonly occurs in mixtures with other conifers. Shrubs and forbs are prominent in the understory, whereas grasses and sedges are minor.

Fauna. The fauna of the western white pine cover type is similar to that of the fir-spruce cover type. The cover type is noted for its population of big game, particularly the Rocky Mountain elk and mule deer. Smaller mammals include the snowshoe hare, long-tailed weasel, marten, coyote, bobcat, and various mice and shrews. The black bear is present. The many birds include the ruffed grouse, chestnut-backed chickadee, red-breasted nuthatch, and Swainson's thrush.

Soils. Most of the soils have formed from ashy materials or have low bulk density and large amounts of amorphous materials, or both. Horizons are weakly developed (Andepts). The most productive sites in this cover type have moist but well-drained soils and occur in valleys and on moderate to gentle slopes with northern exposures.

Land use. Heavy forests cover much of the land; croplands occupy less than 2 percent of the cover type. The forests are important for timber production as well as summer cover for wildlife; the area is famous for its elk hunting. Wood of western white pine is soft and highly "workable," like that of eastern white pine; thus, it is valued for a variety of millwork items.

THE FIR-SPRUCE COVER TYPE

Physiography. The fir-spruce cover type lies within the Sierra-Cascade and the northern, middle, and southern Rocky Mountains provinces. It is normally the highest forest zone in the mountain ranges but varies from as low as 1,500 feet in the Northwest to as high as 12,000 feet in the southern Rocky Mountains. Much of the topography is rough and broken.

Climate. Annual precipitation ranges from somewhat less than 22 inches in the Rocky Mountains to 50–75 inches in the Sierras. In the Rockies, 50–65 percent of the precipitation falls in the warmest months, while in the Sierra-Cascade Mountains province only 25–40 percent falls in the warmest months. Precipitation in the period December to March is 50–60 percent of the annual total in the Sierra-Cascade Mountains and 15–25 percent in the Rocky Mountains. During the frost-free season, precipitation is 20–40 percent of the evaporation potential.

Vegetation. The fir-spruce cover type is characterized by open to dense forests of low to tall needleleaved evergreen trees and patches of shrubby undergrowth and scattered herbs. Fifty percent or more of the stand is silver fir, subalpine fir, red fir, white fir, mountain hemlock, Engelmann spruce, or blue spruce, singly or in combination, except where western white pine comprises 20 percent or more of the stand (in which case the cover type would be classified as western white pine). Because of the dense overstory and limited understory, heavily stocked stands are usually not considered a forage resource for domestic livestock unless timber is harvested by patch clearcuts.

Fauna. Seasonally, the fir-spruce cover type and, in particular, the interspersed openings and stream bottoms with broadleaved woody species such as aspen and willows, are used by moose, elk, mule deer, and white-tailed deer. Mountain caribou originally wintered in Idaho, Washington, and Montana; a few still do. The wolverine, lynx, black bear, mountain lion, coyote, and wolf occur in the cover type. The grizzly bear is present, though in a fraction of its original numbers and is classified as a rare species. Grizzlies are about the only predator of elk and possibly are a useful natural control over excessively large elk herds.

Several of the species that have been mentioned use the fir-spruce cover type only seasonally, primarily as cover or in following migratory routes. This is the case with the mountain sheep and the mountain goat, which occur more commonly in steep rocky areas. Among the birds in the cover type are several of the blue grouse and spruce grouse groups, ruffed grouse, and various chickadees, nuthatches, bluebirds, robins, and jays. Among the more common rodents and lagomorphs are the porcupine, beaver, snowshoe rabbit, squirrels, flying squirrels, pocket gophers, chipmunks, and various species of mice.

Soils. The soils of this cover type are extremely varied. In the Northwest, Inceptisols (Cryandepts and Cryumbrepts) predominate. Ultisols occur in the Sierra Nevada Range. Alfisols (Boralfs) are common in the Rocky Mountains, and there are also significant areas of Entisols. Areas of deep overburdens of absorptive Vitrandepts are very productive sites in eastern Oregon and the northern Rockies.

Land use. Heavy forests cover much of the cover type, and they are used as wildlife habitats and watersheds and for recreation and lumbering. There is virtually no cropland. Much of the area is owned by the Federal Government.

THE HEMLOCK-SITKA SPRUCE COVER TYPE

Physiography. The hemlock-Sitka spruce cover type extends south from British Columbia along the Oregon and Washington Coast Ranges and occupies part of the Cascade Range in Washington. The elevation ranges from 200–4,000 feet.

Climate. The length of the frost-free season for that portion of the cover type along coastal Oregon and Washington is about 200 days. The portion in the northern Cascades has a frost-free season of about 120 days. Precipitation is about 60–115 inches annually in western Oregon and Washington. In western Oregon and Washington, about 60–70 percent of the precipitation occurs in the months of December to

March. In western Washington, the amount of precipitation is mostly equal to double the evaporation potential. In western Oregon, it is 80 percent of potential evaporation.

Vegetation. This cover type is defined as having 50 percent or more of the forest in western hemlock or Sitka spruce or both. Other tree species that may be present to a lesser degree are Douglas fir, grand fir, and western red cedar. Common shrubs include the vine maple, red whortleberry, Cascades mahonia, California dewberry, and coast rhododendron. Usual herbs are American twinflower, hollyfern, cutleaf goldthread, and redwoods violet.

Fauna. The most common large mammals in this cover type include the elk, deer, black bear, and moose. In the hemlock areas of the northwestern portion, the red-tailed hawk, screech owl, pygmy owl, and great horned owl are avian predators. Mammalian predators include mountain lions, bobcats, wolves, the Pacific marten, and the western spotted skunk. Smaller animals include the deer mouse, Douglas squirrel, bushy-tailed wood rat, Townsend's chipmunk, and coast mole. Among the more common birds are the red crossbill, chestnut-backed chickadee, red-breasted nuthatch, raven, gray jay, Steller's jay, hermit warbler, western wood pewee, and pine siskin. Blue and ruffed grouse are also present.

Soils. Along coastal Oregon and Washington and in the northern Cascade Mountains, the soils of this cover type are Inceptisols.

Land use. Nearly all the area is in forest. In the Pacific Northwest, most of the cover type is privately owned. Lumbering is the major industry. The narrow valleys and coastal plains, about 5 percent of the total area, are cleared. Hay for dairy cattle is the chief crop.

THE LARCH COVER TYPE

Physiography. The larch cover type occupies the high mountains of eastern Oregon, northern Idaho, and western Montana. Less than 20 percent of the area is gently sloping. Local relief is more than 3,000 feet. Larch commonly occupies the upper slopes or northern exposures at lower elevations of about 3,500 feet.

Climate. The length of the frost-free season in the cover type is 120 days in the Blue Mountains of eastern Oregon and 80–120 days in the northern Rockies. Annual precipitation is 20–30 inches in eastern Oregon and 20–50 inches in the northern Rockies. Of this precipitation, 40–50 percent occurs in the period December to March in the eastern Oregon area and only 35–40 percent occurs in the coldest months in the northern Rockies. During the frost-free season, precipitation is 20 percent of the evaporation potential in eastern Oregon and 20–40 percent in the northern Rockies.

Vegetation. This cover type is characterized by forests in which 50 percent or more of the stand is western larch, except where western white pine comprises 20 percent or more of the timber volume. Ecologically, larch is considered seral to stands of grand fir and stands of Douglas fir. Understory species are commonly of the genera found in spruce-fir stands and some Douglas-fir stands.

Fauna. The fauna in the larch cover type is similar to the faunas of the Douglas-fir and fir-spruce cover types. Larch, however, being a deciduous conifer, lets more light into the stand during part of the year. The difference in the amount of light leads wildlife to prefer the larch stands at times.

Soils. In eastern Oregon, the soils of this cover type are Mollisols, particularly on north and northeast slopes where there is an overburden of deep, absorptive Vitrandepts. In the northern Rockies, they are Inceptisols, Alfisols, and Mollisols.

Land use. Much of the land is heavily forested, affording wildlife habitats, providing livestock forage, and offering opportunities for recreation, as well as producing timber. Mining is important in northern Idaho and western Montana. A very small percentage of the land is cropped.

THE LODGEPOLE PINE COVER TYPE

Physiography. The lodgepole pine cover type occupies sites on high mountains of Western States. It occurs even in some places where less than 20 percent of the area is gently sloping and at elevations ranging from 4,000–11,500 feet, with local relief more than 3,000 feet. The cover type, however, is best developed on gentle mountain slopes.

Climate. Commonly, lodgepole pine is on sites where the length of the frost-free season is 80–120 days, but it seems to be tolerant of frost at almost any time of year. This species grows where the average annual rainfall is as low as 20 inches, but it can grow well with 50 inches of precipitation. During the frost-free season in lodgepole pine areas, precipitation is commonly 20 percent of potential evaporation and is often 40 percent. Lodgepole pine stands are adapted to varied distribution of rainfall. In the southern Cascade Mountains and the mid-Sierras, lodgepole pine stands receive 50–60 percent of their annual precipitation in the period December to March. Yet, in the middle Rockies they receive only 15–35 percent of their precipitation in this period.

Vegetation. This cover type is characterized by forests in which 50 percent or more of the stand is lodgepole pine. Ecologically, lodgepole pine stands are seral to some of the western interior coniferous forests. "Doghair" stands often develop after fires. Understory species, if present, are of about the same genera as found in stands of western larch, spruce-fir, and interior Douglas fir.

Fauna. The lodgepole pine cover type has about the same fauna as Douglas-fir, larch, and spruce-fir forests of the same elevational zone. Low productivity of understory flora in many cases limits the

number of animals that can be supported. Islands of uncut lodgepole pine provide excellent escape routes and protective refuges or cover for big game animals.

Soils. In the Sierras, the lodgepole pine cover type occupies Ultisols. In the eastern Cascades of Oregon, it occupies Entisols. In the Blue Mountains of eastern Oregon, lodgepole pine grows best on Vitrandepts, which deeply overburden bedrock or Mollisols. In the Rocky Mountains, this cover type occupies Inceptisols, Mollisols, and Alfisols.

Land use. Much of the land of this cover type is forested. About 80 percent is owned by the Federal Government. In addition to producing timber, the forest yields water, affords wildlife habitats, and provides opportunities for recreation. Several national parks are in the area of this cover type.

THE REDWOOD COVER TYPE

Physiography. The redwood cover type occupies only the low coastal mountains of northern California and the southwestern portion of Oregon. Less than 20 percent of the area is gently sloping. Local relief ranges from 1,000–3,000 feet.

Climate. The climate is moist and temperate. Annual precipitation averages nearly 60 inches, of which 10–25 percent falls in the warmest months and 60–70 percent in the period December to March. Normal annual pan evaporation is 40–50 inches. The amount of precipitation is 2.5 to 5 times the potential evaporation during the frost-free season.

Vegetation. The vegetation of this cover type is a dense forest of very tall, evergreen, needleleaved trees, sometimes with much undergrowth, 20 percent or more of the stand is redwood. The dominant plants are redwood and Douglas fir. Other major components of the vegetation include grand fir, salal, Pacific waxmyrtle, coast rhododendron, western hemlock, box blueberry, and swordfern.

Fauna. The Columbian black-tailed or coast deer is present in the redwood cover type. Elk use the cover type in some areas but are much less numerous than in the past. Mountain lions, bobcats, and black bears may be seasonally active within the forest. The red-tailed hawk, screech owl, and great horned owl feed on mice and other small animals on the forest floor. The sharp-shinned hawk and Cooper's hawk prey chiefly on birds. The band-tailed pigeon may occur as a summer resident. The blue grouse is the most common ground-nesting bird. Other characteristic birds include the pileated woodpecker, gray jay, brown creeper, hermit warbler, and red crossbill.

Soils. The soils are Ultisols. Base saturation is low; organic matter content is high. A relatively thin subsurface horizon of accumulated clay is present (Haplohumults).

Land use. Most of the land is in privately owned farms, ranches, or forest. Lumbering is the major industry. Only about 10 percent of the cover type is in grassland used for grazing. The cultivated land in valleys, less than 5 percent of the total area, is used mainly for growing forage and grain for dairy cattle.

THE WESTERN HARDWOODS COVER TYPE

Physiography. The western hardwoods cover type occurs in northern California and southern Oregon on tablelands where 50–80 percent of the area is gently sloping and the relief is only 300–500 feet and on low mountains where slopes are mostly steep and the local relief is 1,000–3,000 feet. It also occurs in the Rocky Mountains, and this portion of the cover type (mostly aspen areas) varies considerably.

Climate. The west coast portion of this cover type has rainy winters and dry summers. Annual precipitation ranges, on the average, from 15 inches in California to 48 inches in Oregon and occurs mostly as rain between the months of November and May. Normal annual pan evaporation ranges from about 40 inches in Oregon to nearly 100 inches in southern California. Evaporation during the frost-free season ranges from about 2 to 5 times the potential evaporation. The climate of the widely scattered Rocky Mountain portions corresponds to that described for adjacent or surrounding cover types.

Vegetation. This cover type is characterized by forests in which 50 percent or more of the stand is hardwood species, except where western white pine, sugar pine, or redwood comprises 20 percent or more of the stand (in such cases the cover type is classified as western white pine or redwood). The vegetation is a forest of low to medium tall, broadleaved deciduous or evergreen trees, sometimes with an admixture of low to medium tall needleleaved evergreens, often with an understory of grass and shrubs.

In the California and Oregon portions of this cover type, dominant species include Oregon white oak, Coulter pine, Digger pine, coast live oak, canyon live oak, blue oak, valley oak, and interior live oak. In California, this cover type lies mainly between the annual grasslands and the chaparral and mixed conifer zones. The widely scattered Rocky Mountain and Plains States "hardwood" portion of the cover type consists primarily of quaking aspen stands with an understory of grasses, forbs, and shrubs. In many places where the aspen stands are inclusions within areas of sagebrush or conifers, they are important sources of food and cover for wildlife. Cottonwood becomes dominant on plains, more or less replacing aspen.

Fauna. In California, several subspecies of mule deer are numerous in various parts of this cover type. The now-extinct California grizzly was once numerous. An occasional black bear comes down from forests at higher elevations. Mountain lions are no longer numerous; the largest numerous predatory animals are the coyote and the bobcat. Avian predators include golden eagles and red-tailed and other

hawks. Two endangered species, the California condor and the San Joaquin kit fox, occur. California quail are often abundant at lower elevations, and mountain quail winter at the higher elevations. The striped skunk is widespread. Among the more common small mammals are the Beechy ground squirrel, kangaroo rat, pocket gopher, and a number of types of mice. Also occurring in this part of this cover type are additional species found in the annual grasslands cover type.

The fauna of the Oregon oakwoods portion of the cover type is somewhat similar to that in the California portion, but species representative of the southern part of the California oakwoods may not be present and more northern species, such as the ruffed grouse, are present. Deer are common; elk were numerous in the past. The western gray squirrel frequents stands of Garry oak. The fauna of the aspen portion of the cover type throughout the Rocky Mountain area is essentially that of the adjacent or surrounding cover types, but the aspen stands serve as important areas of food and shelter for many species of wildlife. Where hardwood stands occur on river bottoms in the plains, they are a home for many arboreal and forest-edge species that are not present in the surrounding open country.

Soils. In Oregon, the soils of this cover type are deep and have well-developed illuvial horizons (Argixerolls). Drainage is generally good. Farther south, in California, the surface horizons are somewhat lighter and lower in content of organic matter, but the illuvial horizon of accumulated clay is again present (Xeralfs).

Land use. Livestock grazing in the cover type is limited to the more open portions of stands adjacent to grasslands. Wildlife find cover in the several variations of the cover type, and the aspen portions provide browse for big game.

THE SAGEBRUSH COVER TYPE

Physiography. The sagebrush cover type is prominent principally on the Columbia Plateaus, in the Northwestern States; in the central portion of the Great Basin, in Utah, Nevada, and southern Idaho; in the Wyoming Basin; and on the Colorado Plateaus and some of the lower reaches of adjacent mountains. This broad cover type occupies vast plains and plateaus derived from lava flows, ancient lake beds, and broad basins of alluvium. The more individual plateau sections are usually delineated in terrace and tablelike fashion and range from rolling lava plains to maturely fringed and dissected mesas. Elevations range roughly from 600–10,000 feet.

Climate. The length of the frost-free season normally is 120 days but is reduced to only 80 days at certain mountain sites. Annual precipitation is 5–12 inches(in some places almost 20 inches), and40–50 percent of it comes in the period December to March. Only 25–40 percent occurs in the warmer half of the year. Precipitation is only 20 percent of the evaporation potential during the frost-free season.

Vegetation. The sagebrush cover type is characterized by shrubs, principally of the genus *Artemisia,* which are usually 1–7 feet high. In some situations, other shrubs are part of the vegetation. In other places, grasses such as those of the genera *Agropyron, Festuca, Poa,* and *Bromus,* as well as broadleaved herbs, are found in the understory.

Fauna. Pronghorn, or antelope, use parts of this cover type as rangeland throughout the year, whereas mule deer prefer to use sagebrush rangeland only during the winter. The Utah prairie dog is an endangered species of this cover type. Other wild mammals that are principal inhabitants of this cover type are the Great Basin coyote, black-tailed jackrabbit, pygmy cottontail, Ord's kangaroo rat, and Great Basin kangaroo rat.

Bird populations are low during the breeding season, averaging only about 25 pairs per 100 acres. The major influent birds include the marsh hawk, red-tailed hawk, Swainson's hawk, golden eagle, bald eagle, Cooper's hawk, prairie falcon, burrowing owl, and long-eared owl. The sage grouse and chukar are important game birds. More than 50 additional species of birds nest within the cover type.

Soils. In the Columbia Plateaus province, the sagebrush cover type occupies Mollisols having black, friable, organic surface horizons and a high content of bases. Inceptisols (Andepts) of ashy nature are conspicuous in parts of the Columbia Plateaus. In the Great Basin and part of the Wyoming Basin, the soils of the sagebrush cover type are Aridisols which have pedogenic horizons, are low in content of organic matter, have a clay horizon in some places, and have accumulations of various salts in some places. In part of the Colorado Plateaus province, as well as part of the Wyoming Basin, they are Entisols, which have no pedogenic horizons. The remaining soils of the sagebrush cover type in the Colorado Plateaus province are Aridisols and Mollisols.

Land use. Most of the land within the sagebrush cover type is used for sheep and cattle grazing, principally in the spring and fall. Where sufficient water is available, irrigation ranching and farming are practiced. The principal crops are hay, grain, potatoes, and beets.

THE DESERT SHRUB COVER TYPE

Physiography. The desert shrub cover type is a composite of various desert shrublands and includes the salt flats of Great Salt Lake, the southwestern desert plains and plateaus, the western third of the Great Basin's mixture of mountains and basins, the eastern edge of the Great Basin, parts of Wyoming and Big Horn Basins, and parts of the dissected Colorado Plateaus.

Climate. The normal length of the frost-free season is 120 days in the more northerly parts of the cover type and 200 days in the southwest. Annual precipitation is only 5–10' inches. In the western portion of the cover type where the Pacific climate has an influence, 50 percent or more of the meager precipitation occurs in the winter, whereas in the more easterly portions, which are under the influence of continental or Rocky Mountain weather, only 15–25 percent of the precipitation occurs during the winter. The amount of precipitation is only 20 percent of the evaporation potential during the frost-free season.

Vegetation. The vegetation of the cover type is characterized by xeric shrubs varying in height from 4 inches to many feet. Stands are generally open, with a large amount of bare soil and desert pavement exposed. Some stands, however, may be relatively dense. Understory vegetation is generally sparse. During years of above-average rainfall, annuals may be conspicuous for a short time.

Fauna. There is a great diversity of habitats in the desert shrub cover type. Consequently, the species of the fauna are quite varied. Dominant animals, however, are characteristically species of rats and pocket mice. In the saltbush-greasewood community, the pale kangaroo mouse and little pocket mouse are common. Animals associated with black sagebrush are the desert wood rat and Nuttall's cottontail. The black-tailed jackrabbit is most numerous in the greasewood sites. The cactus mouse and desert kangaroo rat are abundant in the saltbush desert. Merriam's kangaroo rat is strongly associated with creosotebush. Other important species in the cover type are the long-tailed pocket mouse and antelope ground squirrel.

Common larger mammals in the desert shrub cover type are the desert kit fox, coyote, and western spotted skunk. Desert mule deer and peccary are associated with the paloverde-cactus shrub community. Many desert birds are very selective in their type of habitat. Greasewood may furnish a permanent residence for the loggerhead shrike. Areas where tall cactus is plentiful furnish homes for many birds, including the Gila woodpecker, several species of owl, and the purple martin. Gambel's quail, the cactus wren, and the roadrunner are common in the southern part of the cover type. Reptiles include numerous species of snakes and lizards, including the Gila monster of the tall cactus areas. The Sonoran pronghorn is classed as an endangered species; few if any of this species are left in southern Arizona. The masked bobwhite quail is also an endangered species in this cover type.

Soils. The soils of the desert shrub cover type include Aridisols (with pedogenic horizons) in the Great Basin and on southwestern desert plains and plateaus, Entisols (with no horizons), and Aridisols in the Wyoming Basin and on the Colorado Plateaus. The soil of the Great Salt Flats is unclassified.

Land use. In the northern extension of this cover type, livestock grazing is the principal industry. Much of this grazing is done in the winter. Where irrigation water is available, ranching and farming are practiced. The principal crops are hay and small grains. In some areas potatoes and sugar beets are grown. In the Sonoran Basin and southern Arizona and New Mexico, limited grazing is done at favorable times. Irrigation farming is practiced where water is available. Crops such as cotton, citrus fruits, winter vegetables, and alfalfa are grown.

THE SHINNERY COVER TYPE

Physiography. The shinnery cover type covers considerable areas of sand hills and river dunes across the southern Great Plains, the major portion occurring along the Canadian River. The cover type is estimated to occupy about 6 million acres. The valley of the Canadian River is estimated to be 1,000 feet below the surrounding areas, is cut deep into red sandstone, and is 5–20 miles wide. Terraces, mesas, cliffs, and side canyons characterize the landscape. Water, when the river is low, disappears and reappears through sand beds.

Climate. The shinnery cover type is rather small geographically; thus, the climate is relatively uniform throughout the area. The frost-free season lasts 180–200 days. Precipitation ranges from about 15 inches in New Mexico to 25 in Oklahoma. Two-thirds to three-fourths of the precipitation falls in the warmest months; the amount of precipitation in winter is low. The potential evaporation is several times the precipitation. During the warmest months, precipitation is a quarter of the potential evaporation in the western part of the cover type and one-half in the eastern part.

Vegetation. The vegetation of the shinnery cover type is a mid-grass prairie with open to dense stands of broadleaved deciduous shrubs and occasional needleleaved low trees and shrubs. The major shrubs are Havard oak and mesquite. Little bluestem and side-oats grama are the most common grass species. Sand bluestem is sometimes locally common. Sand sagebrush and yucca are the most common low shrubs.

Fauna. The fauna of the shinnery cover type is a mixture of species common in the surrounding plains grasslands, pinyon-juniper, and southwestern shrubsteppe cover types, forest-edge species also being present along the river bottoms.

Soils. The soils of most of the shinnery cover type are Mollisols. In the extreme western portion are Aridisols. Alfisols are in two small areas. The "island" of shinnery far to the south of the rest of the cover type is on Alfisols. In some places the soils are Entisols.

Land use. Where shrubs are not too dense, livestock grazing is common.

THE TEXAS SAVANNA COVER TYPES

Physiography. The Texas savanna cover type occupies the western end of the West Gulf Coastal Plain and the southern part of the Great Plains. It is commonly referred to as the Rio Grande Plains of south

Texas and the Edwards Plateau of south-central Texas. The Rio Grande Plains is alluvial and is possibly a deltaic plain of the Rio Grande. It is a relatively flat plain about 400–600 feet above sea level, which rises 1,000 feet rather abruptly to the Edwards Plateau. The Edwards Plateau itself reaches an elevation of 3,600 feet at its western end. Its edges are maturely dissected by streams. The surface in its interior is a flatland traversed by dry valleys or "draws."

Climate. In this cover type, the frost-free season ranges from about 250 to more than 300 days. Precipitation ranges from 20–30 inches annually, more than half of which falls in the warmest months and less than a quarter in the period from December to March. Annual evaporation is 70–80 inches; during the period from May to October, the potential evaporation is about twice the precipitation.

Vegetation. This is a high-shrub savanna cover type with a dense to very open synusia of broadleaved, deciduous and evergreen low trees and shrubs and needleleaved, evergreen low trees and shrubs. The grass varies from short to medium tall, and the herbaceous vegetation varies from dense to open. Mesquite is the most widespread woody plant. Others are *Acacia spp,* oaks, juniper, and ceniza along the Rio Grande valley and bluffs. *Opuntia* spp. are widespread. The herbaceous plants are mainly bluestems, three-awns, buffalo grass, gramas, and curly mesquite and tobosa on the Edwards Plateau.

Fauna. The Texas savanna cover type is noted for the abundance of white-tailed deer and wild turkeys. The collared peccary is common in some areas along the Rio Grande, where several species of Mexican or tropical distribution make their only entry into the United States. Examples are the chachalaca and the coatimundi. The armadillo is present. The fox squirrel is hunted in wooded areas along streams. Among the fur bearers are the ringtail and the raccoon.

Great numbers of white-winged doves once nested in brushy areas along the southern Rio Grande, but clearing of land for agricultural purposes has contributed to reducing their population. The golden-cheeked warbler is a rare species. The mourning dove, scaled quail, and bobwhite are game birds in the cover type. A number of hawks and owls are present.

Soils. Soils in the Texas savanna cover type are varied, but the different soil orders are unusually well correlated with the different plant communities within the cover type. The mesquite-live oak savanna, for example, is on the only Entisols within the cover type. The soils of the juniper-oak savanna are almost entirely Mollisols, while an "island" of Alfisols within the area of Mollisols corresponds with the boundaries of the mesquite-oak savanna. In the mesquite-acacia savanna, Mollisols, Alfisols, and Vertisols occur.

Land use. Land that is not cropped and on which the brush is not too dense is grazed by livestock.

THE SOUTHWESTERN SHRUBSTEPPE COVER TYPE

Physiography. The southwestern shrubsteppe cover type occurs south of the Rocky Mountains. It occurs as relatively large blocks of almost-level desert plains isolated between roughly parallel low mountain ranges of the Sonoran Desert, Mexican Highland, and Sacramento section, through southern Arizona, New Mexico, and Texas. This cover type occurs at a lower altitude than the pinyon-juniper cover type and is often referred to as the semi-desert grass-shrub type.

Climate. Temperatures in this cover type are not as variable as in cover types covering larger geographic areas. The frost-free season ranges from slightly less than 180 days in Arizona to more than 240 days at the southeastern boundary, in Texas. Precipitation, half of which normally falls in the warmest months, varies from 10 inches in the west to about 18 inches at the eastern boundary of the cover type. Potential evaporation is high, being 80–90 inches annually. During the warmest months, it is 4–10 times the precipitation.

Vegetation. The southwestern shrubsteppe cover type is characterized by vegetation types ranging from short grass with scattered shrubs to shrubs with scattered areas of short grasses. Yucca is one of the most characteristic woody plants in the cover type. Mesquite is abundant in many areas. Creosotebush and tarbush are dominant among the shrubs. Black grama, three-awns, and tobosa dominate the herbs. Side-oats grama and curly mesquite are also important. The shrub-grass stands occupy shallow soils with no development or little development. The grass-shrub stands occupy the soils with more development.

Fauna. Because of the geographic proximity of the two cover types, the fauna of the southwestern shrubsteppe cover type is similar to that of the desert grasslands cover type. Pronghorn, or antelope, and mule deer are the most widely distributed large game animals. The common white-tailed deer occurs in the eastern portion of the cover type, in Texas. The collared peccary, or javelina, is common in the southern part of the cover type. The white-winged dove is locally important in Arizona, as is the more widespread mourning dove. The scaled quail and Gambel's quail are present in most of the area, and the bobwhite reaches the eastern portion of the cover type. The black-tailed jackrabbit, desert cottontail, kangaroo rat, wood rats, and numerous smaller rodents compete with domestic and wild herbivores for available forage and are preyed upon by the coyote, bobcat, golden eagle, great horned owl, red-tailed hawk, and ferruginous hawk.

Soils. In the western portion of this cover type, the soils are primarily Aridisols. Some are Mollisols. The eastern portions, the Trans-Pecos shrub savanna, are mainly on Aridisols in the north and Entisols in the south. Junipers occur entirely in the areas of Entisols, according to Kuchler.

Land use. The areas in this cover type are used as rangeland except where they have been converted to

irrigation farming or other uses.

THE CHAPARRAL-MOUNTAIN SHRUB COVER TYPE

Physiography. The chaparral-mountain shrub cover type occupies mountain areas more than 3,000 feet high in northern California and southern Oregon, areas ranging from sea level to low mountains (up to 3,000 feet high) in the southern part of the California Coast Ranges, mountains more than 3,000 feet high in the middle Rocky Mountains, low mountains in the Gila Mountains, and low and high tablelands in the southern part of the Great Basin.

Climate. The length of the frost-free season in much of the California portion is 160–200 days, depending on latitude and elevation. One area along the southern coast, however, has a frost-free season of 300 days. In the middle Rocky Mountains, the frost-free period is 80–120 days, depending on elevation. The Gila Mountains have a frost-free period of 160–180 days. In the southern part of the Basin and Range province the frost-free season lasts 200 days. Annual precipitation varies from 10–28 inches, sometimes more. The California area receives only 10–25 percent of its precipitation in the warmest months. The northern part of the Great Basin and the part of the cover type in the middle Rocky Mountains get 40–50 percent of their precipitation in the warmest months. The Gila Mountains and the southern part of the Basin and Range province receive 50–66 percent of their annual precipitation in the warmest months.

Year-round mild temperatures in much of the California portion of the cover type tend to offset some of the disadvantages of lack of rain in summer. Furthermore, coastal areas receive some moisture from fog in summer. The precipitation is normally only 20 percent of the evaporation potential in the middle Rocky Mountains, the Gila Mountains, and the southern Basin and Range province. In California the precipitation is 20–40 percent of the evaporation potential.

Vegetation. The vegetation of the cover type consists of dense to open brush or low trees. Deciduous, semideciduous, and evergreen species are represented. Some of the brush types are so dense that understory vegetation is practically eliminated, while other types support a highly productive understory. Recent activities of man have altered the types of vegetation to such a degree that reconstruction of their original state would be difficult.

Fauna. The fauna is quite diverse from north to south in the chaparral-mountain shrub cover type; however, some species are quite widespread. Mule deer throughout the cover type and white-tailed deer in the south are the most important large mammals. Other large mammals, such as the coyote, mountain lion, bobcat, black-tailed jackrabbit, ringtail, striped skunk, and spotted skunk, are widespread in the cover type. Some important species, such as the javelina and the band-tailed pigeon, are found only in the southern part of the cover type. The wood rat is one of the most characteristic animals of the cover type. Other small mammals include ground squirrels and mice.

Birds are very numerous in the brush types of the cover type throughout the year. More than a hundred species were identified in the scrub oak type in Utah. More than 40 resident birds were noted in the oak-juniper community. Among the birds in the oak-juniper areas are the golden-fronted woodpecker, turkey, and bobwhite. Reptile species are quite numerous in the southern portion of the cover type. Two rare and endangered species are found in the cover type, both in the chaparral community. One of them, the California condor, has its range partially within the community. The other is the San Joaquin kit fox. A third endangered species, the masked bobwhite, has been extirpated from the United States portion of the cover type.

Soils. In the northern part of California, the chaparral-mountain shrub cover type occupies Ultisols that are low in content of bases and have subsurface horizons of clay and weatherable minerals. The remainder of the California portion of the cover type in the Coast Ranges occupies Mollisols which are on steep slopes, are high in content of bases, and lack accumulations of clay; Alfisols, which have accumulations of clay and sometimes have a carbonate-cemented horizon; and Entisols, which have no horizons, are low in content of organic matter, and are less than 20 inches deep in some places. In the Rocky Mountains, this cover type occupies Mollisols that have a subsurface horizon of clay. In the southern edge of the Basin and Range province and the upper Gila Mountains, the cover type mainly occupies Aridisols that have a low content of organic matter and a loamy horizon of accumulated clay.

Land use. Large portions of the California areas of the cover type have been converted to grass range for livestock and for firebreaks. Production of range livestock is the principal enterprise in these places. The vegetation serves as cover to retard erosion and protect watersheds, thus benefiting croplands, high-value developments, and urban areas below. Grassed fuel breaks to retard spread of fires and the required grazing treatment of them are striking and may become more common. The conversion of the shrubland has also increased deer habitats.

THE PINYON-JUNIPER COVER TYPE

Physiography. The pinyon-juniper cover type occupies portions of the Basin and Range province (Utah, Nevada, southern Idaho, and southeast Oregon) with its intermingled basins and mountains, and

also occupies many of the Colorado Plateaus, where it is often adjacent to sagebrush sites. Juniper usually occupies rockier and rougher terrain than sagebrush. Where sagebrush is common on the plains, terraces, and gentle portions of plateaus, the pinyon-juniper cover type tends to occupy the adjacent contiguous sites of eroded and rough dissections.

Climate. The normal length of the frost free season is 120 days. Annual precipitation is 10 inches, 40–50 percent of which occurs during the warmest months in the Great Basin, whereas 50–66 percent occurs during the warmest months in the Colorado Plateaus. Precipitation is normally only 20 percent of the evaporation potential during the frost-free season.

Vegetation. The name "pygmy forest" characterizes the pinyon pine and juniper woodlands of this cover type. The trees occur as dense to open woodland and savanna woodland. They may grow to a height of 30 feet but are generally less than 15 feet tall. They are bushy, being almost as wide as they are tall.

Herbage production is determined to a large extent by the amount of tree canopy. Soil factors that affect the moisture supply, however, also affect the production of herbage. These factors are texture, development of the B horizon, depth of solum, stoniness, and nature of the substrata. Slope or aspect is also a factor.

Fauna. The major mammalian influents in the pinyon-juniper cover type are the mule deer, mountain lion, coyote, and bobcat. Elk are locally important. The less important influents include the wood rat, white-footed mouse, cliff chipmunk, jackrabbit, cottontail, rock squirrel, porcupine, and gray fox. The ring-tailed cat and spotted skunk occur rarely.

The most abundant resident birds in the pinyon-juniper cover type are the gray titmouse, Woodhouse's jay, western red-tailed hawk, golden eagle, red-shafted flicker, pinyon jay, lead-colored bush tit, and rock wren. Summer residents include the western chipping sparrow, night hawk, black-throated gray warbler, northern cliff swallow, western lark sparrow, Rocky Mountain grosbeak, desert sparrow, and western mourning dove. The common winter residents are the pink-sided junco, Shufeldt's junco, gray-headed junco, red-backed junco Rocky Mountain nuthatch, mountain bluebird, western robin, and long-crested jay. Turkeys are locally abundant during the winter.

Among the reptiles are the horned lizard, sagebrush swift, collared lizard, and Great Basin rattlesnake.

Soils. In the Basin and Range province, the pinyon-juniper cover type occupies Aridisols that have pedogenic horizons, are moderate to low in content of organic matter, and may have accumulations of carbonates. In the Colorado Plateaus, the woodland occupies Aridisols, Entisols that have no pedogenic horizons, and Mollisols that have an organic surface horizon and a high content of bases.

Land use. The pinyon-juniper cover type is used principally for grazing and yields a limited amount of timber products, mainly pinyon Christmas trees, pine nuts, and juniper fence posts.

THE MOUNTAIN GRASSLANDS COVER TYPE

Physiography. The mountain grasslands cover type of the western Mountain States consists mainly of open, untimbered areas, yet it is often adjacent to or surrounded by ponderosa pine, Douglas fir, or lodgepole pine at moderate elevations. At high elevations the cover type is subalpine and is on mountain slopes or faces adjacent to spruce-fir forests and patches of alpine fir or whitebark pine. It also occupies some of the best drained soils of valley-like areas intermingled with mountains, and it occupies various foothills, tablelands, and low mountains. The higher mountain settings can be rich with streams and lakes. These beautiful pastoral openings and exposures commonly provide unobstructed mountain vistas that are not observable from mountain terrain completely cloaked in forest.

Climate. The normal length of the frost-free season in most of the mountain grasslands cover type is 120 days. In the mountain valleys of the northern Rocky Mountains, however, it is less than 120 days, being only 80 days or less at high elevations. Annual precipitation in much of the cover type is 20 inches, and in the high mountains it is 30 inches or more. During the warmest months in central Colorado and east of the Continental Divide in Montana, 66–75 percent of the precipitation falls. In the northern Rocky Mountain grasslands west of the Divide, 50–66 percent comes during the warmest months, and in the Palouse hills of the Northwest, only 25–40 percent comes during this period. Annual precipitation is 30–35 percent of the evaporation potential.

Vegetation. Although the mountain grasslands cover type ranges from foothills at northerly latitudes to high mountain sites, it is characterized throughout by bunchgrasses of the fescue and wheatgrass groups.

Fauna. In the foothills portion of the mountain grasslands cover type, pronghorn, or antelope, are resident and mule deer are winter visitors. Where there is an interface with the sagebrush cover type, common animals are the black-tailed jackrabbit, pygmy cottontail, and various mice. At low to medium elevations, various subspecies of ground squirrels are present, as well as the badger. At medium to high elevations, the grasslands seasonally support Rocky Mountain elk and mule deer. The pocket gopher is well distributed throughout the cover type. Predators, which are well distributed at high elevations, are the bobcat, black bear, and coyote. Two of the more common birds present are the robin and horned lark. Marsh hawks, sparrow hawks, and golden eagles are common raptors.

Soils. In central Colorado the cover type occupies Aridisols and Mollisols with developed horizons. In the Yellowstone River area of south-central Montana, the grassland soils are Entisols with no horizon

development. In the grasslands of the northern Rocky Mountains, the soils are Alfisols and Mollisols. Mollisols are also the major soils of the Columbia Plateau's foothills or Palouse hills. Much of the central and eastern portion of rolling hill land is locally termed part of the Palouse Prairie and has wind-laid soil of great depth.

Land use. Much of the cover type at lower elevations or on foothills was plowed soon after settlement for production of small grains, most notably the Palouse Prairie hills of north central Oregon and the extreme eastern portion of Washington and adjacent parts of Idaho. Unbroken portions of the foothill grasslands on steep slopes and in canyons are used as spring-fall range for livestock and as winter range for big game.

THE MOUNTAIN MEADOWS COVER TYPE

Physiography. The mountain meadows cover type consists of wet to intermittently wet sites in the forest zone of mountains in the Western States. Typically it occurs on almost flat to gently sloping topography, as in valleys and basin-like areas along lakes and streams, where surface or subsurface water accumulates in the root zone for at least part of the year.

Climate. Saturation of the soil in this cover type during at least part of the growing season is strongly related to local topography or geology, rather than to the climate of the cover type. There must, however, be adequate annual precipitation on the site or runoff from higher areas to create the soil moisture conditions necessary to the development of the meadows. The temperature regime of meadows is generally that of the surrounding areas, yet in some cases, meadows are the sites of frost pockets in which temperatures deter establishment of some forest stands as effectively as intermittent high moisture in the rooting zone.

Vegetation. Grasses, sedges, rushes, and, in some cases, phreatophytic shrubs dominate the mountain meadows cover type. Under the best conditions, 70 percent of the ground is covered by vegetation, more than three-fourths of which may be perennial grasses. Sedges may constitute as much as 15 percent of the cover. Perennial forbs with showy flowers make up only about 10 percent of the cover. The proportions of the various growth forms are easily manipulated by the degree and timing of grazing.

Fauna. In many places this cover type contains lakes and streams that provide water for wildlife, and it is usually more productive of herbage than surrounding areas. Thus, it attracts fauna daily from the larger cover types in which it occurs. The wetter meadows, especially those with streams or permanent lakes, are a home for such wildlife as beaver, waterfowl, and fish. The fauna of intermittently wet meadows may shift as moisture conditions change. For example, the burrowing rodents and the predators that feed on them use the meadows only during the drier periods. Deer, elk, and moose are among the large mammals that, although they use heavy timber sites for cover, depend heavily on meadows for food. In large expanses of forest and rangeland, the meadows are about the only suitable habitat for the nesting of migratory waterfowl.

Soils. Soils of mountain meadows commonly have been, and currently are, recipients of alluviation, illuviation, or glaciation products from above. Consequently, no classification by soil orders is attempted for this cover type.

Land use. Small, high-elevation mountain meadows commonly have not been cultivated. Only at lower elevations or in more accessible areas have meadows been converted to hayland or drained and farmed. On the other hand, many small mountain meadows have been obliterated by road building and trails made by horses used for recreation. Disturbances to plant cover have, in some cases, resulted in the cutting of streambeds to such depths that the water table has been lowered. Where this has happened, the meadows have lost their productive herbaceous cover and have been invaded by brush or lodgepole pine stands.

THE PLAINS GRASSLANDS COVER TYPE

Physiography. The plains grasslands cover type, also known as the Great Plains, occurs on a broad belt of high land that slopes gradually eastward and down from an altitude of 5,500 feet near the eastern foothills of the Rocky Mountains to an altitude of 1,500 feet in the Central States, where it gives way to the prairie cover type. The most striking feature of the cover type is the phenomenal flatness of the interstream areas, which make up a great expansive fluviatile plain or alluvial slope. The eastern margin has been most exposed to erosion, being near the trunk line of drainage and in a climate of greater rainfall than the western edge. The plains grasslands cover type of 280 million acres is larger than any other vegetation region in the United States.

Climate. Temperatures vary considerably, the frost-free season ranging from less than 100 days in the north to more than 200 days in Texas. The cover type is characterized by periodic droughts. Average annual precipitation ranges from 10 inches in the north to more than 25 inches in the south, 68–80 percent of the precipitation falling in the warmest months. Normal annual pan evaporation is roughly four times the precipitation. Precipitation ranges from about one-third to one-half of potential evaporation.

Vegetation. Short, warm-season grasses predominate in this cover type, and there is a minor interspersion of forbs and shrubs. Vast stretches are dominated almost exclusively by blue grama, buffalo grass being a companion in many areas. The eastern part of the cover type, however, is dominated by grasses of medium stature, such as western wheatgrass and needlegrass. The occasional shrubs include

juniper, silver sagebrush, silver buffalo berry, and skunk bush sumac in the northern reaches and rabbit brush and mesquite in the southern part. Forbs are generally quite common, but many are ephemerals.

Fauna. Huge herds of American bison once migrated with the seasons across the central plains. Currently, the pronghorn, or antelope, is probably the most abundant large mammal, but mule deer and white-tailed deer are often abundant where brush cover is available, as along stream courses. The white-tailed jackrabbit occupies the northern part of the cover type and the black-tailed jackrabbit can be found in the area south of Nebraska. The desert cottontail is widespread. The lagomorphs, the prairie dogs, and a variety of small rodents are preyed upon by the coyote and a number of other mammalian and avian predators, one of which, the black-footed ferret, is classed as an endangered species. The wolf once existed on the plains in great numbers, feeding to a considerable extent on bison.

The lesser prairie chicken, formerly abundant, is now classed as a rare species. Sage grouse, greater prairie chickens, and sharptailed grouse are present in the area. Among the many smaller birds are the horned lark, lark bunting, and western meadowlark. The endangered golden-cheeked warbler is in the southeastern portion of the cover type in places where the Ashe juniper is present. Stock pond construction has created an important "duck factory" in the northern Great Plains.

Soils. The soils of this cover type are varied. Mollisols occur from the Canadian border to the southern boundary of the cover type in Texas, as do Entisols. Alfisols and Aridisols are less extensive and are mostly in the southern portion.

Land use. Large areas of the most productive sites have been converted to crop farming; the remainder is rangeland.

THE PRAIRIE COVER TYPE

Physiography. The prairie cover type is relatively large contiguous grassland that lies between the deciduous forests of the East and the short-grass plains of the West, on the flat to rolling hill land of the Central Lowland. Topographic relief delineates the boundaries of this cover type, the 1,500-foot contour being the western boundary and the 500-foot contour being the eastern boundary. The northern limits extend into Canada, and the southern limits extend into southern Texas. Most of the lands of this cover type, excluding those south of the Missouri River, are those of young glacial drifts and dissected till plains. The area south of the Missouri River is older, has well-developed drainage systems, and is flat to rolling hill land.

Climate. The climate varies widely in this cover type. The length of the frost-free season varies from less than 120 days in the north to almost 300 days in the south. On the east, from Texas to Indiana, the prairie boundary lies close to the 40-inch isohyets. On the west, the southern boundary is near the 30-inch isohyet; further north, the prairie reaches the 20-inch isohyet. In general, more precipitation occurs in the warmer part of the year. During the growing season, the amount of precipitation, on average, varies from 60 percent of potential evaporation in the west to 100 percent in the east.

Vegetation. The prairie cover type is known to many as the tall-grass or true prairie. Bluestems constitute about 70 percent of the vegetation and reach heights of 5–6 feet in lowland areas. Large numbers of flowering forbs are present but are usually overshadowed by the grasses. Most of the plants are classified as warm-season plants. Woody vegetation is rare. Willow occurs in some places in exceptionally moist areas of the northern part of the cover type, and needleleaved evergreens and broadleaved deciduous trees are scattered in the southern part. Deciduous trees are common along permanent streams in the eastern portion.

Fauna. Bison once grazed at the western margin of the tall-grass prairie, and the pronghorn, or antelope, is still present there. Jackrabbits are common residents of the prairie, and cottontails are present where there are streams and cover. Burrowing rodents include ground squirrels, prairie dogs, pocket gophers, and many smaller rodents. Burrowing predators include the badger and the black-footed ferret, now considered an endangered species. The Texas red wolf is classed as an endangered species on the southern border of the cover type. The coyote is still common.

The northern portion of the prairie cover type is an important breeding area for a number of species of migrating waterfowl. Many of these migrators winter on the coastal plains of Texas and Louisiana. Mourning doves have become abundant as shelterbelt plantings have developed. Among the gallinaceous birds, the sharp-tailed grouse, greater prairie chicken, and bobwhite are present in fair numbers. The northern greater prairie chicken, however, is considered a rare species, and Attwater's prairie chicken, on the gulf coast of Texas, is listed as an endangered species.

Soils. The soils of the prairie cover type are primarily Mollisols. There are smaller areas of Entisols and one small area of Vertisols. Most of the soils have dark upper horizons.

Land use. Most of the cover type has been converted to cropland.

THE DESERT GRASSLAND COVER TYPE

Physiography. The desert grasslands cover type occurs in scattered areas on tablelands of moderate to considerable relief in the Colorado Plateaus province—in Arizona, New Mexico, and Utah and on the plains with low mountains of the Mexican Highland section in southwestern Texas. Elevations range from 5,000–7,000 feet. These tablelands or plateaus are moderately to severely dissected by rugged

canyons.

Climate. The amount of precipitation in this cover type is low, ranging from 8–12 inches annually. Usually more than half falls in the warmer part of the year. During the frost-free season, the evaporation potential is five or more times the normal rainfall. The frost-free season ranges from more than 200 days in Texas to about 120 in Utah.

Vegetation. The grass life form predominates on these plateaus at intermediate elevations, and shrub life forms are dominant at higher and lower elevations. In transition zones, shrubs give way to galleta to black grama to blue grama. Consociations of these species occur, but almost pure stands are the rule. Tobosa replaces galleta in the southern extensions in Texas of this cover type, and three-awn becomes the dominant in the northern extensions in Utah. In its northern extensions, this cover type is more open grassland with low shrubs.

Fauna. Pronghorn, or antelope, are the primary larger mammals in the desert grasslands cover type. Mule deer also occur. The coyote and bobcat are among the chief animal predators. They prey on black-tailed jackrabbits, cottontails, wood rats, and a large number of small rodent species, such as the kangaroo rat and the deer mouse. Scaled quail range into the grasslands, especially where brush has made an invasion. Among the smaller birds of the cover type are the horned lark, several sparrows, the loggerhead shrike, and nighthawks. Avian predators include the golden eagle, great horned owl, and various hawks.

Soils. The soils are almost entirely Entisols that have no pedogenic horizons and Aridisols that lack pedogenic horizons and are never moist for as long as 3 consecutive months.

Land use. Most of this cover type is used as rangeland.

THE WET GRASSLANDS COVER TYPE

Physiography. The wet grasslands cover type is characterized by the narrow belt (1–50 miles wide) of coastal wet prairies and marshes stretching from the Mexican border to Long Island, NY, exclusive of the coastline of Florida, Georgia, and the Carolinas. It is also characterized by the Everglades and the palmetto prairie of southern Florida, the tule marshes of the low fluviatile plain in the California Trough, and the flood plains of the Great Salt Lake and other lakes of the Intermontane Plateaus.

The coastal prairie is a plain of clay alternating with sands and is almost untouched by erosion, except for the steep-sided channels of transverse streams, whose bottoms may be 30–40 feet below sea level. The Everglades are a permanent swamp. The palmetto prairie, adjacent and to the north, is slightly drier. Both occupy an extensive, almost flat, marl and limestones shelf generally covered with a few feet of muck and a little sand. The tule marshes of central California are the result of the Sacramento and San Joaquin Rivers forming natural levees at low altitudes (10–60 feet above sea level) that entrap water along these rivers. There are numerous lakes along these rivers, and many have been drained and are used as cropland. These lakes, in the broad, flat silt floors of basins with internal drainage, are of the playa type.

Climate. The wet grasslands cover type varies so greatly geographically that any general climatic description is of questionable value. Rainfall in the Central Valley of California may be less than 10 inches; thus, the wet conditions in the “tule marshes” are due primarily to topography and runoff. Other areas in the cover type receive much more precipitation, which amounts to as much as 60 inches or more in the Everglades. The length of the frost-free season ranges from practically all year in extreme southern Texas and Florida to less than 200 days in the northern end of the cover type, on the upper Atlantic coast. Potential evaporation ranges from many times the rainfall in California to less than the annual rainfall in the eastern portion of the cover type. In the far-flung coastal portions of the cover type, intrusion of salt water may have more effect on the vegetation than does climate or soil.

Vegetation. The coastal prairies (marshes) are occupied by cordgrasses, including smooth cordgrass and saltmeadow cordgrass (the latter being more prevalent on the Atlantic coast), saltgrass, and a few forbs. The vegetation forms a medium to very tall grassland, usually dense. The palmetto prairie and Everglades are dense, medium to tall grasslands. There are scattered palms and shrubs on the palmetto prairie and scattered low to medium tall broadleaved evergreen trees and shrubs in the Everglades. The major species of the palmetto prairie are wire-grass and saw-palmetto. The major plants of the Everglades grassland are sawgrass and three-awns. The vegetation of the tule marshes is a tall, graminoid vegetation consisting of tules and other bulrushes, cattail, and soft flag. Several species of sedges occur less commonly.

Fauna. The fauna of the wet grasslands cover type varies as much as its geography. The cover type, especially in open-water and marshier areas, serves as a seasonal home for tremendous numbers of migratory waterfowl. The Central Valley of California and the coastal marshes of Texas and Louisiana are prime examples. Endangered species, including the whooping crane, the Texas red wolf, and Attwater’s prairie chicken, use the Texas coastal area, and the American alligator is a yearlong resident of the gulf coast and the Everglades. Other endangered species that formerly made more use of the cover type are the Florida panther of the Southeast and the tule elk that once ranged into the California tule marshes. Most of the fauna are tolerant of a moist or wet environment. Many species from adjacent prairies and forests make extensive use of the wet grasslands. Fresh- and brackish water fishes, reptiles, and amphibians are abundant and varied.

The Everglades has a wide variety of influent species from adjacent palmetto prairie, cypress swamp, magnolia forest, and mangrove areas. A slight change in the water level causes marked changes in the habitat and the fauna. Among the many mammals are the white-tailed deer, Florida panther, black bear, raccoon, bobcat, opossum, skunks, bats, marsh and swamp rabbits, cotton rat, and fox squirrel. Avian fauna is very varied; many influent species are cited in descriptions of adjacent areas. Before the water level in much of the Everglades was lowered by drainage, the area was the home of large numbers of herons, egrets, limpkins, mottled ducks, Everglade kites, and other birds. Now the Florida great white heron is classified as rare. The Everglades kite is classified as endangered.

Soils. Soils in this cover type are extremely varied, all soil orders found in the continental United States being represented. Entisols are prevalent in the Central Valley of California.

Land use. Because of wide variations in site conditions, there is no consistent pattern of land use in this cover type. It is used for hunting, fishing, trapping, crop production, improved pasture, rangeland, and other purposes.

THE ANNUAL GRASSLANDS COVER TYPE

Physiography. The annual grasslands cover type is characterized by the California steppe vegetation community, which occupies extensive areas in the Central Valley of California and along the Pacific Coast. This community is often referred to as the California annual or foothill grasslands. These grasslands form a discontinuous zone between the upper limits of the valley floors and the western hardwoods cover type, which occurs mainly at elevations between 500 and 2,000 feet above sea level. The Sierra-Cascade Mountains are on the east, and the California Coast Ranges are on the west. The California steppe occupies the lower foothills of these ranges. The foothills are rolling hills interspersed with numerous level valleys.

These lands have their origin in colluvial material from the mountain ranges and fans of alluvial material. The flow of alluvial and colluvial material is much stronger from the Sierra-Cascade Mountains on the east than from the Coast Ranges. Consequently, the accumulation is much greater and more extensive on the eastern side of the Central Valley than on the western side; it is more obvious in the San Joaquin Valley than in the Sacramento Valley. Numerous small springs and seeps occur throughout the cover type, the water table being close to the surface in the bottoms of valleys.

Climate. Most of the annual grasslands cover type has a climate of hot, dry summers and mild, relatively moist winters. The length of the frost-free season is 250–300 days. Precipitation ranges from less than 10 inches at low elevations in the southern portion to more than 40 inches at the higher elevations at the northern border. Little rain falls in the summer. Up to three-fourths of the annual precipitation may fall in the period December to March. Potential evaporation during the warmest months is often many times the precipitation. These climatic conditions are extremely favorable for the growth of cool-season annuals, which make up practically all the herbage.

Vegetation. The vegetation of the cover type is of grass life form. Annual grasses, mostly introduced, dominate the cover. The dominant plants are wild oats, several species of brome, wild barley, and fescue. Perennial bunchgrasses, where they occur, include needle-grasses, creeping wildrye, and pine bluegrass.

Perennials are scarce or absent at lower elevations and increase at the upper elevations of the cover type. Forbs, with the exception of filaree, are numerous but of secondary importance. Many people believe the prehistoric vegetation was perennial, but historical evidence is meager and reconstruction of the original perennial vegetation (if it were perennial), if it can be done at all, is accomplished only with complete protection and considerable effort. The earliest references, from the early 1800's, indicate that the California steppe was dominated by annual grasses. In this cover type, annual plants, with their short life cycle and rather shallow root system, have probably shown the most consistent and profitable response to range fertilization.

Fauna. Intensive agricultural development has changed the fauna of the annual grasslands cover type. Many species have been eliminated or "moved up in the hills." The California grizzly, wolf, and pronghorn, or antelope, have long since disappeared, and the San Joaquin kit fox is classified as an endangered species. Several species of mule deer occur in areas with brush. The California quail is now numerous mainly in areas where brush or rock outcrops provide cover. The mourning dove occurs throughout the area. Common mammals include the Beechy ground squirrel, cottontail, black-tailed jackrabbit, mice, and kangaroo rats. Many species, such as the coyote and bobcat, occur in, or enter from, the adjacent woodlands.

Common birds include the horned lark, western meadowlark, western kingbird, mockingbird, loggerhead shrike, house finch, lesser goldfinch, red-shafted flicker, and scrub jay. The rattlesnake is an important predator of rodents. The roadrunner feeds partly on reptiles. Other avian predators include the golden eagle, redtailed hawk, and Cooper's hawk. A number of snakes and lizards are present. Additional species occurring in this cover type are found in the western hardwoods cover type.

Soils. The soils of this cover type are mostly Entisols and Alfisols. In general, the Entisols are at the lower elevations of the Central Valley, and the Alfisols occur at slightly higher elevations, away from the valley floor. A small area of Aridisols occurs in the more arid southern portion of the San Joaquin Valley.

Land use. The land at the lower elevations of what once was the annual grasslands is mostly irrigated and makes up the bulk of one of the richest agricultural areas in the world, the Central Valley of California. At slightly higher elevations, some land is dry farmed, but the area is mostly used for grazing by cattle.

THE ALPINE COVER TYPE

Physiography. The alpine cover type occurs largely as an interrupted chain of stands on the highest peaks in the Rocky Mountain and Pacific Mountain systems. Valley glaciers have sculptured most alpine areas and provided open, spectacular landscapes. Cirques, hanging tributaries, and various types of moraine are common.

Climate. The climate is rigorous. The average monthly temperature may be 3 °C in January and 50 °C in July. Frost may occur any night during the summer. Precipitation is estimated to be 35–50 inches per year, falling mostly as snow. Evaporation and wind movement are marked.

Vegetation. Grasses and grasslike species of rather low stature predominate, but the number of associated forbs is large. Dwarf willows occur in some places on the moist soils of protected slopes and valleys.

Fauna. The pika, pocket gopher, and yellow-bellied marmot are the only permanent mammalian residents of the alpine cover type. Summer visitors include mule deer, elk, mountain sheep, weasels, marten, chipmunks, and the golden-manteled ground squirrel. The only nesting birds are the horned lark, water pipit, black rosy finch, rock wren, white-tailed ptarmigan, and robin.

Soils. The soils of this cover type commonly have no pedogenic horizons (Entisols), have weakly differentiated horizons (Inceptisols), or have a low supply of bases and an accumulation of amorphous materials in subsurface horizons (Spodosols). These cold soils normally belong in the cryic great groups. The terrain is sometimes referred to as “fragile,” because of the ease with which the soils can be displaced by horses’ hooves on recreation trails or water eroded where ground cover becomes broken.

Land use. This cover type provides summer grazing for sheep under careful management. Their deep snowpacks make areas in the cover type prime watersheds. The cover type provides opportunities for summer and winter recreation and habitats for wildlife.

THE AGRICULTURE COVER TYPE

The agriculture cover type includes land used mainly for production of food crops, such as wheat, corn, soybeans, or commodities such as cotton. This cover type is not restricted to a particular climate, physiography, or soils, but occurs where economic conditions are favorable. The best examples of this type are the former prairies of the Midwestern United States, which have been replaced with corn and wheat, the Central Valley of California where vegetable crops are grown, and the Mississippi basin where soybeans and other agricultural crops are produced. In other areas, the agriculture cover type is intermixed with natural cover, which provides an idea of natural vegetation that is characteristic of the section.

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Map unit descriptions are presented for the 190 sections delineated on the U.S. Department of Agriculture Forest Service 2005 map "Ecological Subregions: Sections and Subsections of the Conterminous United States." Brief descriptions of the section map units provide an abstract of the climate, physiography, geologic substrate, soils, and vegetation that integrate to form ecosystems with unique ecological characteristics.

Keywords: Biological characteristic, ecological unit, ecoregion, ecosystem, physical feature, subregion.

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